THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXV. No. 1918.] LONDON, FEBRUARY 13, 1900. [52ND YEAR. PRICE 6d.

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Illuminating Power . . . 16·4 Candles.
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SEVERAL DESIGNS SHOWN BELOW.

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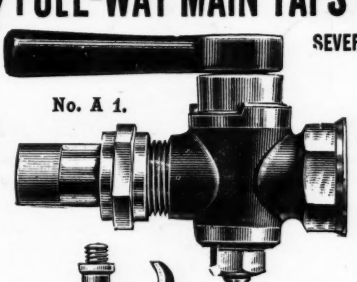
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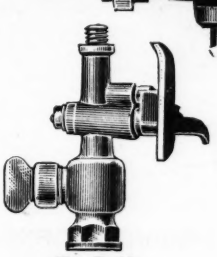
LANTERN TAPS.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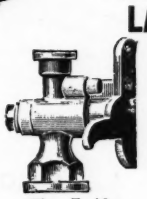
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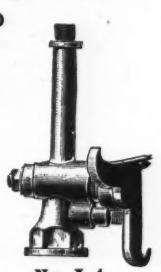
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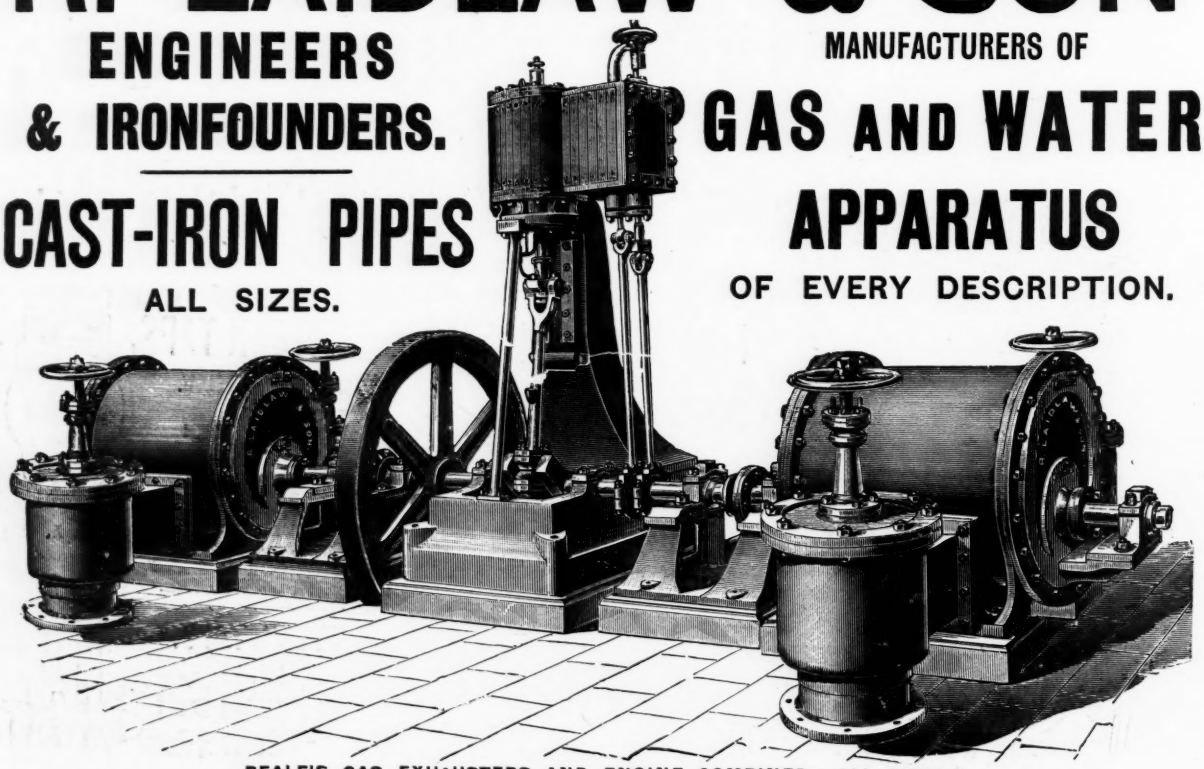

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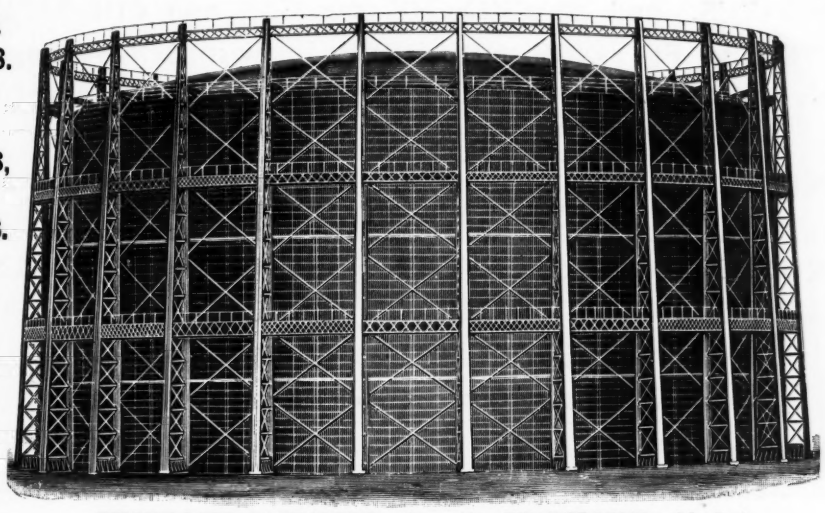

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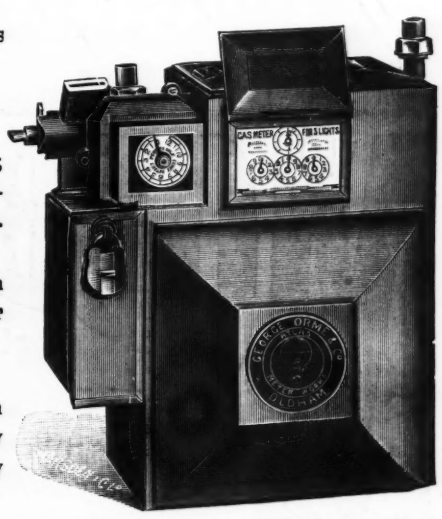

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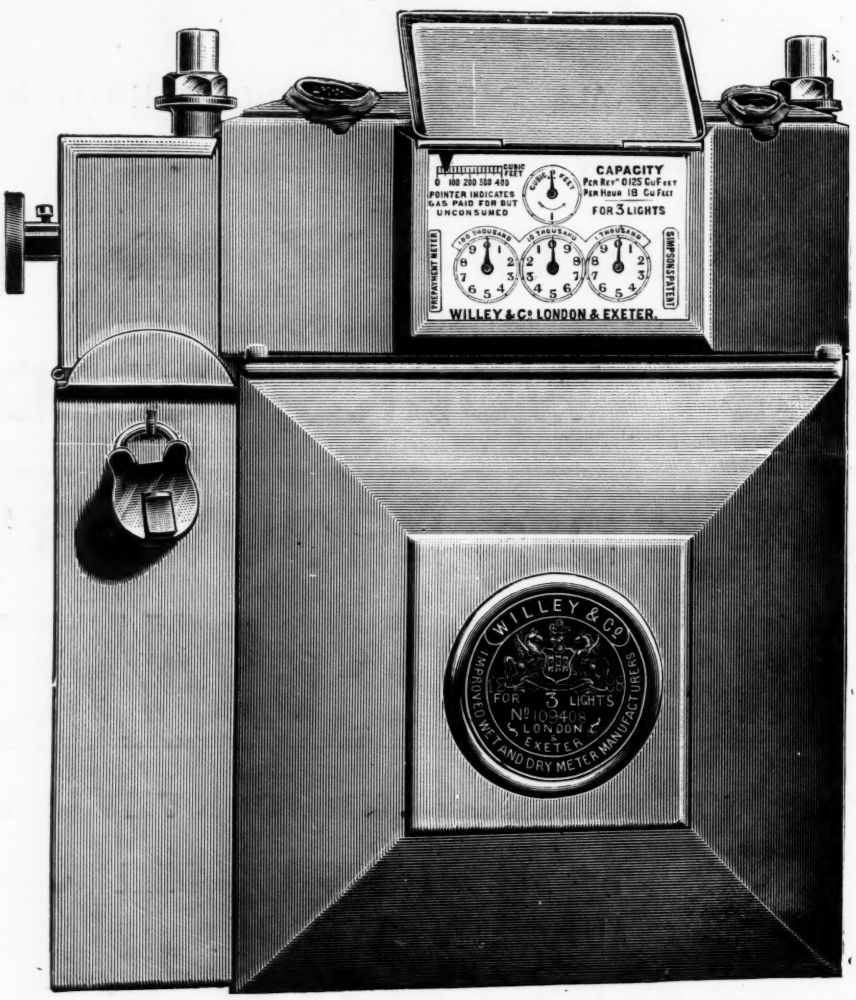

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Prepayment Meters for any coinage, unexcelled for Accuracy and Reliability.

Tens of Thousands in use, and adopted exclusively by many Gas Companies.

PUBLIC CAUTION!!

The Trade and the Public are warned against the **INFERIOR IMITATIONS of the NEW WELSBACH (KERN) BURNER** lately placed upon the Market. All DEALERS and USERS of the

NEW WELSBACH (KERN) BURNER

are requested to IGNORE THE NEWSPAPER THREATS of the New Sunlight Incandescent Company, Limited, and, in case of an action being brought, TO AT ONCE COMMUNICATE WITH THE WELSBACH COMPANY, who, upon receipt of the writ, are prepared to take the defence of the action into their own hands, and to indemnify the person attacked from all consequences.

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DEALERS and USERS are also WARNED not to believe the rumours circulated by Infringers that the

WELSBACH COMPANY'S PATENT RIGHTS

expire shortly. These rights

EXIST UNTIL 1907

and the Company will continue to uphold their rights, and to **suppress all Infringers of Mantles as well as of Burners.**

The Welsbach Company are doing their best to hasten the trial of the action now pending in respect of the

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Dealers and the Public are Cautioned against Buying, Selling, or Using the said Mantle.

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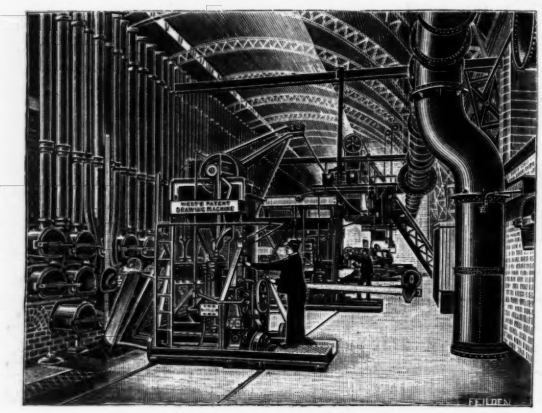
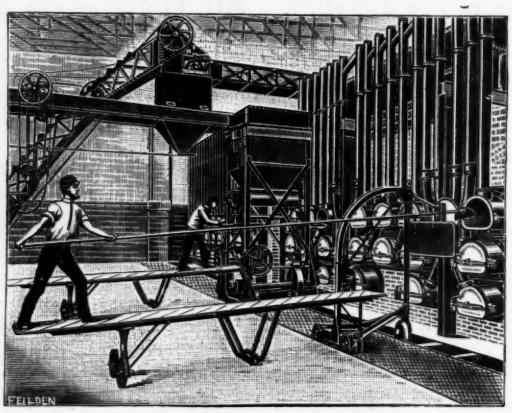
MANCHESTER.



West's Compressed Air Charging and Drawing Machinery for Gas-Retorts.



West's Manual Charging and Drawing Machinery for Gas-Retorts.

WEST'S

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Silent Coke-Conveyor.

SPECIAL FEATURES:

This Conveyor is specially adapted for Elevating and Storing Coke in the Coke Yard or Overhead Hoppers.

SILENT IN ACTION, and is easily driven; the power required for driving being very small.

Has easily renewable and inexpensive wearing parts.

Is fitted with HUNT'S PATENT ROLLER CHAIN, which is specially adapted for the conveying of gritty materials, as the Rollers prevent excessive wear of the Chain Wheels.

The working parts of the Chain and Slide-Bar are easily and efficiently lubricated by a special lubricator fixed at one point.

No Rivets or Bolts in the Chain to work loose; the whole of the Chain being kept together by the Joint Pins.

DOES NOT MAKE ANY BREEZE, as the Coke does not roll over in its passage along the Conveyor; and no violent rubbing of the pieces against one another occurs.

CONTRACTORS FOR

West's Patent Regenerator Furnaces and Settings, Mouthpieces, Retort-Bench Fittings, &c. Air-Compressors, Hauling-Capstans, and General Engineering.

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DENAYROUZE LIGHT SYNDICATE

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THE PIONEERS

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WITHOUT CHIMNEYS.

The "SMALL TORCH" Burner (Bandsept Patent) for Street Lighting, consuming 3½ feet of Gas per hour. Having an efficiency of 25-Candle Power per Cubic Foot of Gas consumed, it is not only the BEST but CHEAPEST Intensive CHIMNEYLESS Burner on the Market.

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A SYSTEM OF BURNING VAPOURIZED PETROLEUM WITHIN AN INCANDESCENT MANTLE.

A Light of 1000-CANDLE POWER produced at a cost of less than

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STREET-LAMPS—Self-Contained Plant, easily fixed, no tearing up of Thoroughfares.

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SPECIAL TERMS TO GAS COMPANIES.

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ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820·80.

VERY FREE FROM IMPURITIES.

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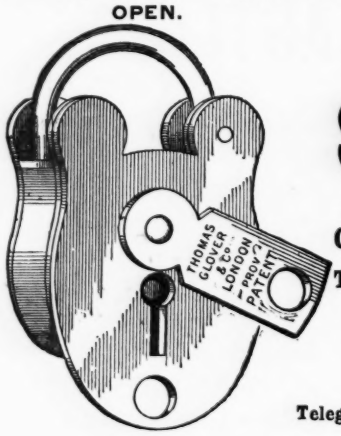

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PREVENTS TAMPERING WITH THE

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The Padlock is Sealed by means of a Lead Eyelet, which is impressed with Company's private mark. Eyelets easily fixed and removed by Company's Collector.

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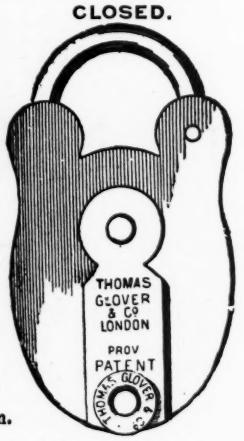

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MANCHESTER: 37, BLACKFRIARS STREET. *Telegraphic Address:* "GOTHIC." Telephone No. 3395.

GLASGOW: 69-71, McALPINE STREET. *Telegraphic Address:* "GASMAIN." Telephone No. 6107.

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"ACME" GAS-STOVE WORKS,

ASTON, BIRMINGHAM.

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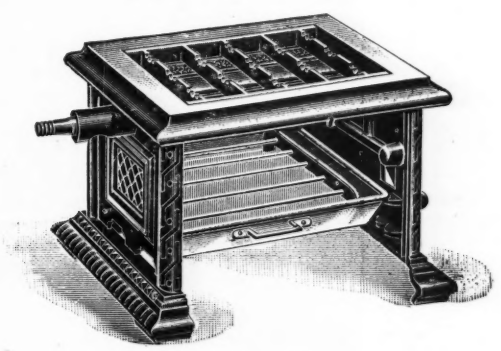

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Sample of either sent on application, Carriage Paid.

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Telephone: No. 612.

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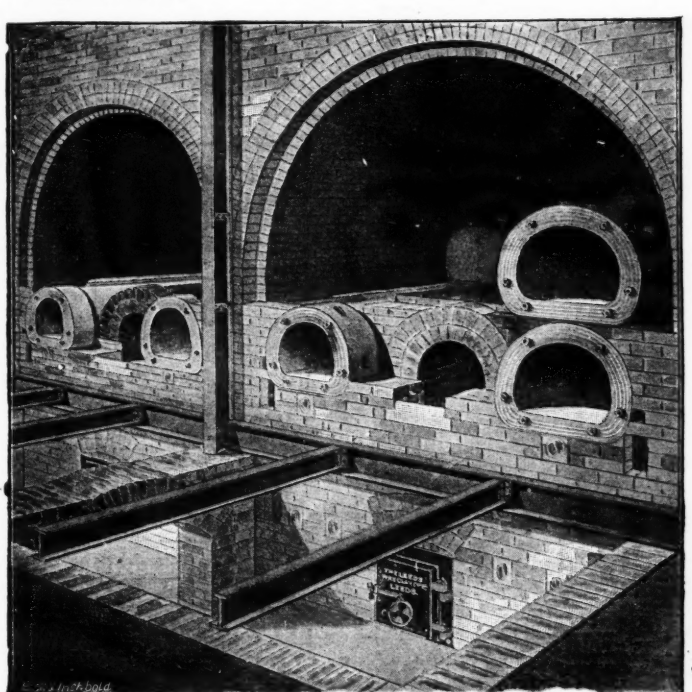

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OF EVERY DESCRIPTION

INCLINED, HORIZONTAL,

REGENERATOR, GENERATOR,

and DIRECT FIRED.

SHALLOW REGENERATORS A SPECIALITY

MANY INSTALLATIONS.

EXCELLENT RESULTS OBTAINED.

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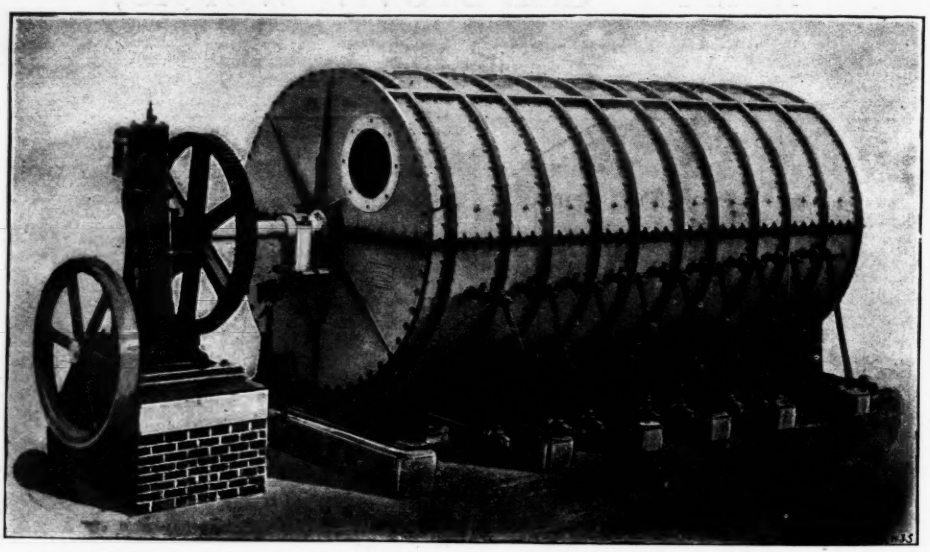
BUILDINGS, ROOFS, &c.

KIRKHAM, HULETT. & CHANDLER, LD.

PATENT "STANDARD" WASHER-SCRUBBERS

Complete Extraction of Ammonia and large proportion of CO_2 and H_2S.

Maximum Strength Liquor produced, Minimum Water Supply and Driving Power required.



Old Pattern Machines fitted with latest Improvements at Small Cost.

PATENT "STANDARD" WASHER-SCRUBBER (one of two) recently erected at the Devon Street Works of the Birmingham Corporation.

Nearly 600 in use.

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COAL AND COKE STORAGE PLANTS.

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WHARF ELEVATORS FOR UNLOADING BARGES.

ELEVATORS & CONVEYORS for BOILER-HOUSES.

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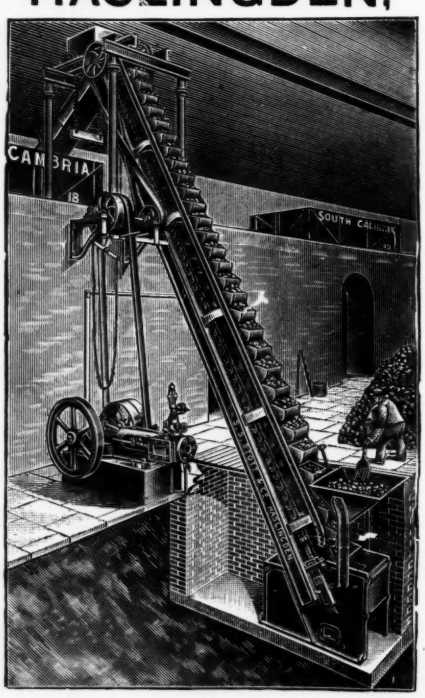
DETACHABLE CHAINS AND SPROCKET WHEELS.



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HIGH-CLASS STEAM-ENGINES up to 1000-Horse Power.

PUMPS, HORIZONTAL AND VERTICAL, SINGLE, DOUBLE, or THREE-THROW, for WATER-WORKS, &c.

BEAM PUMPING-ENGINES.

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FOR THE FOLLOWING UNDERTAKINGS:—

American construction is instanced only when from the LONDON Designs of Messrs. Humphreys & Glasgow.

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Copenhagen (Second Contract)	2,500,000
Belfast	1,700,000
Belfast (Second Contract)	4,500,000
Brussels	700,000
Brussels (Second Contract)	700,000
Liverpool	3,500,000
Liverpool (Second Contract)	4,500,000
Tottenham	750,000
Tottenham (Second Contract)	750,000
Santiago de Cuba	400,000
Swansea	750,000
Manchester	3,000,000
Brighton	1,750,000
Preston	1,500,000
New York	1,200,000
Southport	750,000
Bath	1,000,000
Newburgh, N.Y.	350,000
Newburgh, N.Y. (Second Contract)	250,000
Hoylake	125,000
Coventry	600,000
Coventry (Second Contract)	600,000
Bordentown, N.J.	125,000
Winchester	200,000
Shanghai	225,000
Stockport	500,000
Norwich	1,000,000
Holyoke, Mass.	600,000
Lea Bridge	350,000
Lea Bridge (Second Contract)	350,000
Stockton-on-Tees	500,000
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Dorking	125,000
McKeesport, Pa.	500,000
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Bremen	550,000
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Epsom	225,000
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Aarhus	800,000
Falmouth	150,000
Southampton	800,000
Hartlepool	750,000
Utrecht	1,000,000
Deventer	150,000
Portsmouth	1,000,000
Bournemouth	1,000,000
Aylesbury	150,000
Hamburg	1,750,000
Dublin	2,000,000
Redhill	275,000
Posen	450,000
Dunedin (N.Z.)	150,000
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Brighton (Second Contract)	1,750,000
Croydon (Second Contract)	625,000
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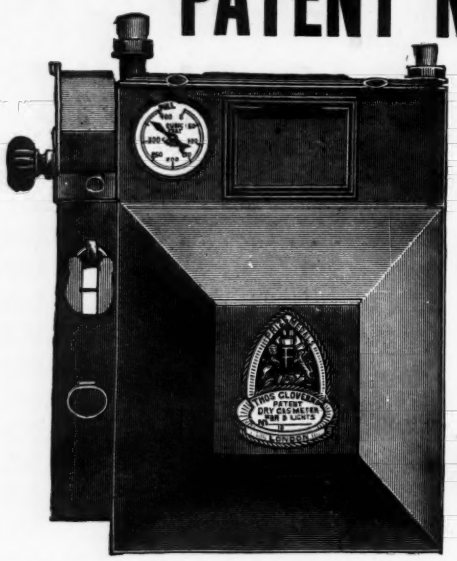

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EDITORIAL NOTES.

The Coal Difficulty.

"WE are to-day, with regard to the maintenance of our "supply, in a condition upon which no Gas Company can "look without some anxiety." In such terms did Colonel Makins sum up the position of his Company, in regard to their coal stocks, some ten days ago; and the sharp snap of wintry weather that was then just beginning to make itself felt, and has since become more severe, has not tended to lighten "the only dark spot" on the horizon of the majority of gas undertakings. "General January" fortunately did not prove himself a very terrible antagonist—much of the weather being of that open character that appears to be so favourable to the development of influenza—and yet we learn that the deliveries of gas throughout the Metropolis during that month were considerably in advance of those recorded during the same period last year. This is a clear proof of the stimulus afforded to the use of gas for other than illuminating purposes by the present high price of coal. Should February continue as it has begun, and the history of 1895 repeat itself, the consumption will, in spite of lengthening days, undoubtedly maintain its high level—if the Companies have the coal wherefrom to make it! To pray for sun, and to long for summer, is indeed an unaccustomed attitude for the gas manager. Not only, however, is the Ice King an unwelcome visitor (under existing circumstances) on account of the consequent increased consumption of gas, but, so far as the Metropolitan Companies are concerned, because of the possibility of added difficulties in getting coal to their in-town works, dependent therefor to a large extent upon canal-borne supplies.

The immediate situation may, in fact, without exaggeration be described as critical; and the next week or two may prove the closest pinch of all. Contractors, we learn, are doing nothing, or next to nothing, to make good the long overdue deliveries; and in many cases they are scarcely sending in the equivalent of current consumption. Even, however, were the immediate cause of anxiety removed by the arrival of sufficient of the purchased supplies, Directors have before them, in the more or less near future, the serious problem of negotiating fresh contracts. To buy, or not to buy; that is the question. What is to be the price? For what period the contract? To buy, and find the price fall heavily in a few weeks; but, then, not to buy and the price to go up—ay, there's the rub. The present is surely a time when the value of consultation between the chiefs of the great Metropolitan undertakings, and of, perhaps, concerted action in a matter of such vital importance, would have been fully demonstrated. Is it yet an impossibility? As to whether the present state of the market is or is not "absolutely unreal," one fact recently published is instructive as showing that the high prices quoted are being obtained for more than small lots of coal. The Swedish State Railways buy their fuel in the North of England; and they recently invited tenders for the supply of 420,000 tons during the ensuing twelve months—an increase, be it noted, of 100,000 tons over the previous year's purchases. They have, up to the present, closed with offers (from the Northern Counties and Scotland) of 270,000 tons of West Hartley Main, Lambton, and Cowdenbeath coal, at prices equal to about 17s. 6d. f.o.b. in the Tyne, or an advance of some 7s. over the recently expired contracts. The quantity purchased, it will be seen, is no matter of an odd cargo or so, but represents nearly a winter quarter's supply for the South Metropolitan Gas Company.

The large increase in the quantity of coal exported to foreign countries is, indeed, a factor by no means to be lost sight of in forecasting the future of the market. The exports for January show an increase of 55,000 tons over the same month last year, and of 178,000 tons over January, 1898—the bulk of the excess going to France, though some has gone to Natal; while much interest has been excited (leading to questions in both Houses of Parliament) by the reported purchase of 400,000 tons of Welsh coal for shipment abroad. The coal exports have, in fact, risen during the past 25 years from 10 per cent. to close upon 20 per cent. of the total output of the kingdom. Bearing these facts, and the prospects of the iron and steel trades, in mind, we are unable to see any hope of anything but a

considerable advance over current contract prices being paid for the supplies needed for 1900-1. Neither, however, do we see any obvious reason why coke should not realize a high, if not a proportionately high, figure.

Coal Miners and the High Price of Coal.

It is not often that we find ourselves in agreement with a Trade Union leader; but in Mr. Benjamin Pickard's letter to "The Times" of Saturday—refuting the suggestion that the present high price of coal is due, in any considerable degree, to an advance in miners' wages—we find little to dispute. The President of the Miners' Federation points out that during the past two years the members of that Association have obtained an increase only equal to about 3d. per ton; and that, under the terms of their existing arrangements with the coalowners, they cannot ask for any further advance this year—the current rates being the maximum obtainable under such agreement. We wonder whether the members of the Federation, at the present time, feel any weakening whatever in their antipathy to the sliding-scale method of adjusting wages! If they adhere loyally to the terms upon which they can now negotiate such adjustments, it must be imputed to them for a virtue that will tend to a most desirable increase of confidence on the part of the masters in the reliance to be placed on a voluntary bargain. Mr. Pickard also touches upon the question of the effect upon the output due to the industry or idleness of the miner. He declares that "the "men work as hard now as ever they did." We may take the opportunity, in mentioning this declaration of the head of the Federation, to explain what some of our readers, we believe, have mistakenly considered to be a discrepancy between remarks made in these columns last week, bearing upon the restriction of output owing to the habitual refusal of coal miners to work full time, and our earlier references to the point. That there is no real inconsistency in the several expressions of our views thereon will be seen on a careful consideration of what has been written. We have pointed out (what is perfectly true) that the scarcity of coal is due to increased demand, and not to any reduction in the total output last year as compared with preceding years, and that the miners have been working quite as well as formerly, and in some cases even a shade better. The "idling miner" theory is therefore, we have said, not the original cause of the failure of contractors to supply. They must, earlier in the contract year, have sold elsewhere—as witness the increase of exports of coal which practically accounted for the excess output in 1899—trusting to force their output later in the season. The shortening of the labour supply owing to the war then helped to frustrate that intention; but what finally upset their calculations was the fact that the miner was content to do just about as much work as, or but little more than, he had formerly got through. The colliery proprietors are, therefore, unable to do what the owners of any other commodity for which the demand greatly exceeds the supply would at once do—namely, greatly increase the output, and reap the harvest. The men are certainly not responsible for the increased demand; in some degree, however, they are responsible for the failure to increase the supply.

The Legal Protection of Street-Lamps.

In the "Journal" for Sept. 26 last year, we recorded and commented upon a noteworthy little case of damage by a mineral-water van to a lamp-post in the Crystal Palace district, in which the Company failed to obtain redress by Police Court proceedings against the owners of the van. The reason for the failure was that section 20 of the Gas-Works Clauses Act, 1847, under which the proceedings were taken, bears reference only to the person who actually does the act complained of—in this case, the driver of the van—and not against his master. It was a remarkable instance of exception from the general rule of law that a master is liable for the acts of his servants, for which the Court had to seek guidance from a decided case under a parallel enactment. Not that the master escaped liability, but only that he did not come under the personal liability created by the statutes in question. Consequently, nothing daunted by their trip in procedure, the Company sought their remedy in an action at common law for damages, and recovered. The defendants appealed, somewhat litigiously, on the ground that this common-law remedy was barred to the plaintiffs by the specific remedy given them in the Act of 1847, which they could use against the servant. Having shot their statutory bolt, and missed, it was argued that they could not try again. The obvious answer is that the special remedy was an addition to, not a supersession of, the common-law remedy. Wherever a new offence is created by statute, the special remedy enacted in regard to it by the same statute is the only one that can be properly taken. The special remedy provided by section 20 of the Act of 1847 is to protect the new objects of the highway—public lamps—which are allowed to be put there under section 6 of the same Act. Otherwise, a wayfarer might affect to regard the lamps as a nuisance and an encroachment, and consider himself free from any obligation to exercise care in respect of them. It would be easy to suggest cases in point. In the present instance, the Gas Company took the proper course of suing the master for damage committed by his servant in the ordinary way of his employment; and they have prevailed. It would have been just the same if the van had smashed somebody's shop window in turning a corner. The appeal seems to be mere litigiousness, which has been rightly punished.

Concerning the Municipal Civil Service.

Rather less than a hundred years ago, and in a city not wholly unlike London in some respects, although possessing some marked characteristics of its own, a discussion arose on a certain occasion in the Town Council over the amount of salary that should be attached to a particular appointment in the Corporation service. There is nothing remarkable or extraordinary in the fact of such a discussion taking place. On the contrary, it is one of the commonest incidents in the working of Local Government institutions. Something very suggestive did, however, come out in the course of this debate; and we desire to extract it from its commonplace surroundings in order that those worthy servants of their generation who give their time and talents to the work of local administration may ponder its bearings. It was this: A complaint was made that a late holder of the appointment in question had not been adequately paid. The reply of the immediate head of the department was: "He would have had more "if he had gone the right way about it." A perfectly natural observation, perhaps, and offered, we may be sure, without the faintest shadow of an intention to wound, or the smallest suspicion that it contained an explanation and the condemnation of a system. Yet we make bold to declare that whoever ponders these homely words well and in the proper spirit, will end by profoundly regretting that such a confession could ever be truly made as regards the inner administration of an English municipal department. A notorious municipalizer, speaking recently in public, very properly drew his hearers' attention to the magnitude and importance of the municipal civil service of this country. He pointed out that, regarded as a career open to smart young fellows leaving school or college, this kind of civil service offers higher remuneration and better prospects than the Government civil service to which those young people who can floor an examination paper with accuracy and despatch have for so long been encouraged to look for a livelihood. This is perfectly true, although there is another side to the picture; and no true patriot would in reality rejoice over the increase of the spirit of "functionaryism" in this country beyond the point to which competitive examinations for Government posts, and the Board School system of exalting clerical employment to the injury of handicrafts, have already carried it.

What we wish to show now is that the candid confession we have quoted, if it does not exactly imply that in the municipal civil service "kissing goes by favour," only too surely corroborates the suspicion that in this employment those officials who have an aptitude for "taking the "length of the Chairman's foot" do better for themselves than men who only know their duty, and do it. Of course, tactfulness, and that invaluable *savoir faire* which enables a man to get on satisfactorily with those above as with those beneath him, must always count for much in the success of every man holding a public office; but that it should be possible to say of an official that he might have had more money if he had known how to go about getting it, damns the service at the same time that it accuses the officer of awkwardness, or want of tact, or whatever else was his drawback. Whatever may be the shortcomings of the Government civil service, at least the pay and promotion of the members, from the highest to the lowest, are fixed and known. When once a man is accepted and assigned his

work, he has not to be everlastingly thinking and scheming for his own advancement in grade or emolument. This is a lesson which is not yet fully learnt by those who direct the municipal civil service of some cities—perhaps of the largest, least. The London County Council, for instance, have notoriously failed to understand this part of the science of municipal administration. For, undoubtedly, if the service of local authorities is a branch of the civil service of the nation, and as such is to be regarded as an eligible career for aspiring youth, the management and direction of this civil army is as much a science or art as the successful conduct of any other business or undertaking. Yet, by our democratic system, all sorts of people get into positions where they are able to influence the prospects of other men who have given their lives to municipal service; and woe be to the latter if they do not know how to "go the "right away about" everybody on the Council. Remember West Ham and its Surveyor!

If the Association of Municipal Corporations were of any sort of real use, they might be asked to appoint a small Committee to inquire into this subject, and frame general rules for the organization of the municipal civil service upon principles similar to those which have given this nation the purest, the most efficient, and the cheapest civil administration in the world. We all grumble at our Government offices occasionally; and people who have to support, or do business with, municipal officials will sometimes gird at the way they do their work. But those whose Progressive views incline them to favourably entertain the large extension of municipal employment of all sorts and conditions of men and women, should first see to it that the foundation of an honest, capable, and self-respecting municipal service is laid in an impartial, impersonal system of pay, promotion, and encouragement. It is monstrous that men who are presumably good enough for their work—or they would not be kept on—should depend for their bread on their powers of "carneying" to a Chairman of Committee, and judiciously keeping on the "blind side" of some mountebank of a Town Councillor. Yet this is a feature of municipal service which prevails to a greater or less degree in too many corporations, while the danger of it exists in all.

A Plea for Light-Reflecting Street Frontages.

Not a great while since, we had occasion to notice in this column the remarks of a travelled Englishman on the dinginess of the frontages of British towns, which is so greatly answerable for the gloominess of our streets by night, notwithstanding the higher standard now observed in regard to the provision of public lighting. We return to the subject for the purpose of suggesting that this is a matter to which, when fitting opportunity offers, the attention of the leaders of fashion in architecture, and the authorities who have a voice in the ordering of the styles of street front elevations, might be directed with advantage. Since architects have become a race apart, it has often been a cause of marvel with people who merely have to use buildings for business or residential purposes whether these artists in brick and stone are ordinary mortals. Elevations and sky-lines, mouldings and styles, seem to occupy the professional architect, to the more or less complete eclipsing of considerations of air, light, comfort, or suitability. One very often hears the wretched occupant of a monumental public building—be it Law Court, Government Office, or even showy shop—wish the eminent architect who designed the structure had to live in it. For the present, we will confine ourselves to the criticism of the material of street frontages, from the point of view of the sanitarian and public lighting engineer. British streets being frequently sloppy and dirty to a degree unknown in countries with a dry Continental climate, and the amount of wheeled traffic being enormous, common sense would suggest that the possibility of washing down the lower frontages with a hose and a powerful stream of water would be kept in mind by the architects. Is it? How many of the very newest street buildings, not only of London, but also of Manchester, Liverpool, Birmingham, and other cities throughout the land, have frontages cut and fretted until it is hopeless to think of keeping them clean!

Then, as to the lighting. Reflection being of the first importance as an aid to the cheerfulness of street fronts, all our architects go in for dark terra cotta, portland stone, or pressed brick, which can be warranted to become a gloomy no-colour in a year or two, and make the thoroughfare look like a vault when the sun does not happen to be shining brilliantly. Good old-fashioned stucco, kept clean and painted white, or very nearly so, is the real source of much of the brilliancy of the night scenes of Continental capitals. There is, of course, no necessity for sticking to stucco. Effective use has been made, in spots, in London and elsewhere, of highly-glazed light-tinted bricks and tiles. Much more of this needs to be done. Let anybody take up a post of observation on some dirty night at a part of a street where the public and other lights have a chance of being reflected from a painted or glazed white frontage, and let him compare the effect with that of the same number and powers of lighting in front of plain terra cotta, portland stone, or even stock brickwork. By day, the difference is scarcely noticeable. In sunlight, portland stone is almost light itself; but by night, in the rain, a stone-fronted street looks like a crypt. The London County Council are going to build a great new thoroughfare in Central London; and they have reserved to themselves powers for controlling the architecture of the frontages. To those who know what sort of standard of taste in architecture is likely to rule a British County Council, the circumstance does not offer an excessive guarantee that the new street will be as worthy of its position as would be the case (say) in Brussels. If, however, the County Council will but insist on one essential for the architecture of the street, and of all other streets similarly situated as regards atmosphere and light—that the materials of which the frontages are to be built shall be cleanly and capable of reflecting light in a high degree—the result will be that the new thoroughfare will possess beauty and brilliancy of its own that people will journey miles to see. Of course, the architects will protest that such a rule would be an outrage on Art—meaning that it would give them more trouble, and make them think a little more than a mere stylist has to do. It would do the architects good to compel them to have more regard to the conditions of common town life in, and usage of, buildings. Mr. W. Emerson, the President of the Royal Institute of British Architects, had a glimmering of what most architects need in this regard, when, in his address to students the other day, he reminded them that buildings should be "not only artistic, "but also scientific." That is the point. Beautiful stupidity, whether in a building or a person, is bad to live with.

Another Light that Failed.

An amusing example of litigation, smelling slightly of gas, but not sufficiently so for inclusion in our reports of law cases, recently occupied the attention of the Deputy-Judge in the City of London Court. Last year—so lately!—the defendant "had a patent for making gas from petroleum "for lighting and domestic purposes, and it was proposed "to use it for manufacturing purposes. It consisted of "driving air into petroleum in a generator so as to manu-"facture gas." Our readers may have heard of something like this before. The British Patent Office, with its usual impartiality, gave the inventive genius his patent; and on the strength of it he proceeded to get the necessary gas-works apparatus and put a fitter on to set it up in his (the fitter's) own little workshop at Wood Green. The "invention" took a deal of "developing;" and in the meantime the sanguine patentee used to bring "counts" and "honourables" to see it, with the ultimate view of bringing out a Company. Again, the story seems to be only too familiar. So, also, was the end. "Nothing came of "the matter." Now and then the inventor was able to get a light from his own apparatus; but when he could not do so, he had to fall back on the shop gas. After seven months' struggling against the inevitable, the inventor ceased to frequent the premises where his hopes lay shattered; and the proprietor sent in his little account for material supplied and work done. This charge differed from the amount which the disappointed patentee considered reasonable, and the parties went to law about it. Thus there was nothing in the action that could be regarded as a point of gas law; but the whole affair is worth passing notice as furnishing one more proof of the infatuation of ignorant "inventors" for "greased air" gas processes. This ignorance seems like something tangible. It appears to exist in the air, like a contagion, and to leave one set of victims ruined and discredited only to reappear in others. It is a real plague, which has to wear itself out wherever it shows itself. We purposely confuse the ignorance of technical matters with the illusory invention

which feeds upon it, because of the close connection between them. It is the "invention" which betrays the ignorance. Unhappily, most of these "greased air" gas processes never get very far before they need something more than simple ignorance to sustain their feeble life. When and where will the next "invention" of the kind be materialized? For the delusion is as everlasting as the confidence trick. "Truth crushed to earth shall rise again." Yes; but unfortunately this resiliency is a quality which truth shares with its opposite.

Gas-Supply Regulation in Massachusetts.

THE particulars of an instance of the exercise of their plenary powers by the Massachusetts Gas Commissioners are given in another column. It is always interesting to see how differently in various countries the economic problem of gas supply is dealt with; and in the case of Massachusetts we have the spectacle of gas supply subjected to the control of an Authority which is our Quarter Sessions, Board of Trade, and Parliamentary Committee rolled into one. The Massachusetts Gas Commissioners had a splendid opportunity for the display of their wisdom and authority in the example of the Haverhill Gaslight Company. This undertaking started in 1853 with a share capital of $45,000, which was increased in 1871 to $75,000. The Company paid a regular dividend of 8 per cent.; and meanwhile spent their surplus profits to the amount of $275,000 in extensions. Everything went on very comfortably with this prosperous concern; and the local public seemed to think that the price they had always paid for gas was simply part of the scheme of the universe. A day of reckoning was coming, however, and, as not infrequently happens, it was hurried on by the action of the victims themselves. A Company was formed ostensibly for the purpose of doing a financing business; but really the first and only transaction it did was to buy up the Haverhill Gas Company's stock by exchanging for it its own nominal capital of $500,000 in 5 per cent. debentures. This was a little too barefaced, and the consumers petitioned the State Gas Commission to interfere. The Gas Company were actually making a 50 per cent. dividend, and extending their works to boot. After this, who shall say that gas supply is a moribund industry? The Gas Commissioners do not appear to have been able to stop this monstrous transfer performance; but they have declared that the consumers ought not to be required to bear the additional burden of the watered capital, and have summarily ordered a reduction in price to such a figure as will checkmate the financiers. Just like an English Quarter Sessions, only more so!

Mr. Ritchie on the Housing Problem.

THE coming into force of the London Government Act of last year is being attended by various premonitory signs and portents. Mr. C. T. Ritchie, the President of the Board of Trade, has been expounding to the members of the local governing bodies of the East-end of London his views of the way by which the tremendous problem of the better housing of the working-class population may be most hopefully attacked. He pronounces in favour of the policy of going outside the towns and making working-class settlements. Risky as this expedient is, it seems the only economical alternative to that costly rehousing of the population on cleared intramural sites which is much too expensive to be carried far. It has been shown that in London the expense of acquiring the ground and clearing an insanitary area alone amounts to £500 per family—that is to say, to more than the average cost of freehold land and dwellings in an open locality. There are, of course, many risks to be run in letting local authorities go outside their own limits to make industrial settlements; but what of the risk of letting existing conditions go from bad to worse? The jerry builder, friend of the human race that he is—for he works while the philanthropists and politicians are talking—has no prejudices as to the site of his "eligible cottages." Who has built West Ham, and Stratford, and Ilford, and all that marvellous hive of humanity whose life-blood ebbs and flows through that immense Liverpool Street Railway Station every day? Whoever they may be, these are they whom the Authorities should consult as to the making of new settlements outside the radius. Unless the Authorities are wisely advised, they will get themselves involved before very long with all sorts of fads and fancies—of the electric-light-for-workhouses order—which will bring undeserved discredit upon their operations.

WATER AND SANITARY AFFAIRS.

WE conclude to-day our abstract of the final report of the Royal Commission on Metropolitan Water Supply; the portion dealt with being that in which the Commissioners offer suggestions in reply to the inquiry addressed to them as to whether, in the event of the Companies' undertakings not being acquired by a public body, additional powers of control should be exercised by local or other authorities, and, if so, what those further powers should be. The first difficulty encountered by the Commissioners was about the definition of the word "control," as to the meaning of which a wide divergence of opinion had been made apparent in the course of their inquiry. The London County Council submitted a formidable set of "conditions" of control" which they thought worthy of consideration, though they were careful to point out that they were not suggestions as to the nature of the control the Council would recommend. Their position was that no control could be a settlement of the question—that, in fact, the formulation of a scheme would be impossible. The Commissioners thereupon attempted the "impossible;" starting with the declaration that by "control" they understood measures by which the due performance of the existing statutory obligations of the Water Companies could be "efficiently and conveniently secured and enforced." The Commissioners first of all review the various enactments affecting the Companies, and come to the conclusion that some remedy is provided therein for every breach of a statutory duty. But the very parties who should have taken steps to put these enactments in force have been too apathetic to do so. Control, in a certain measure, was in their hands, yet they would not exercise it. The Commissioners pass from this matter to consider the more urgent one of the draught made by the Companies upon the Thames and Lea, and the storage and filtration of the water thus obtained. As the result of all the evidence submitted to them, they come to the conclusion that no restriction should be placed on the taking of flood water from the first-named river. With regard to filtration, they are willing to leave all details to the Companies; but they think that the Official Water Examiner should have jurisdiction over them. It is freely acknowledged that no impediment has ever been thrown in his way; but we nevertheless agree with the Commissioners that he should have the right to enter and inspect the works at any time, and we are at one with them in refusing this right to Local Authorities. No Company, we believe, will object to the recommendation that returns should be furnished to the Water Examiner as to the pressure in the mains at certain hours, and the minimum depth of water in their reservoirs, leaving the Local Authorities to take such action as they please. As to controlling the pumping operations of the Companies, this is a matter which the Balfour Commission investigated very carefully; and so Lord Llandaff and his colleagues did not feel called upon to reopen the question. At the same time they concur in their predecessors' recommendation that the Companies should observe the effect of these operations, and furnish the results to the Water Examiner.

The next really important matter taken up by the Commissioners is the checking of waste; and the whole of the portion of the report in which they deal with it is interesting reading. Some months ago it was pointed out in "The Times" that twice as much water is lost in London as would suffice for the supply of the whole of Birmingham; and it is grievous to be compelled to add that it is lost through sheer carelessness. The Commissioners show how this waste can be reduced by the use of meters; and their remarks may be profitably studied in connection with the interesting paper by Mr. Schönheyder given in the "JOURNAL" last week (p. 335), and dealt with below. They tell us that the New River Company brought their supply down to 30·5 gallons in 1896 and to 31·5 gallons in 1898; and they point out that the difference of 5 gallons in the consumption per head per day, when the population of London reaches the estimated 12 millions in 1941, will represent an addition of 60 million gallons to the daily supply. Waste of water, which, as they say, "benefits nobody and is wholly indefensible," proceeds from wilfulness or neglect. Of course, imperfect fittings are in many cases the cause; and the recommendation of the Commissioners on this matter is a very proper one.

They consider that the Companies should be empowered to require that all fittings should be tested and approved by them, and made to conform to properly framed regulations. They are quite conscious of the existence of jealousy on the part of some Local Authorities in regard to giving such powers as these to a trading Company; but they see no ground for it. Cisterns, again, afford another illustration of the need for intelligent revision of the present regulations, and even of the legislation, on the subject of fittings; and the Commissioners think that whoever supplies the water should have some kind of supervision over the vessel for storing it. But the difficulty here is to make the householder keep it clean. The Commissioners would put upon the Local Authorities, as the guardians of the public health, the responsibility for looking after this matter. They think the measures of control they suggest should be "kept alive" even in the event of purchase, though they do not for a moment distrust any representative or other public authority.

Before closing their report, the Commissioners throw out a suggestion which must not be left unnoticed. They express the opinion that the jurisdiction of the Local Government Board, or that of the Railway Commissioners (whose connection with the water supply of the Metropolis was established by the Act of 1897), might be usefully extended in another direction. They consider a company should exercise prudent forethought, and set about such works as increased reservoirs, enlarged filter-beds, and additional pumping power, "in advance of the "time when they will actually be required," if the supply is to remain constant and efficient. We are pleased to find that the Commissioners lay special stress upon the fact that the failure of the East London Company to maintain a constant supply in 1898 might have been prevented or mitigated, "if Parliament had not, in 1893, rejected the "Bill by which they asked for powers to construct addi-"tional reservoirs"—a proceeding which they repeated last session. The Commissioners unhesitatingly place in the right quarter the blame for these reverses; and they evidently think there should not be a chance of their repetition. They suggest, therefore, that it would be useful to extend the powers conferred upon the Local Government Board by the Metropolis Water Act, 1871, so as to include inquiry into the provisions made by a Company for meeting the present and future wants of consumers in their area of supply. Such an inquiry should, they think, be made only upon the initiative and under the responsibility of the Board. On this matter only one remark is necessary, and that is that the suggestion made by the Commissioners has been anticipated by the Bill which the associated Water Companies are promoting this session, and which received the approval of the shareholders last week. The scope of this measure, which is to carry out the recommendation of Lord Balfour's Commission, has already been fully explained in our columns.

Matters of current moment monopolized our attention in this column last week, and excluded comment on the paper (then published) on the subject of water supply by meter which Mr. William Schönheyder brought before the Institution of Mechanical Engineers at their annual general meeting. The presence of several eminent Water-Works Engineers—some of whom took part in the discussion—and others who have the management of towns' supplies attested the common interest in, and importance of, the question. The purpose of the paper was to demonstrate, first, the value to water suppliers of saving waste even down to dribbles, the multiplicity of which in a district forms a serious whole; second, that those persons who permit this waste should pay for it; third, that the best way of curtailing waste, or securing payment for it, is by measuring the water delivered; and, fourth, that the positive meter invented by the author is, in point of accuracy, the best yet devised for general application to residential supplies. In his modesty, the author did not say this with such pointedness; but his audience could not infer otherwise than that this was his opinion upon hearing his criticisms of other types of meters and his statements (drawn from experiment) as to the exactitude in performance of his own invention. In what he said, however, Mr. Schönheyder was well within his right. He has spent years in the study of water measurement and in the perfecting of his meter. For his labours, all praise is due to him; and if the product of those labours proves—as it bids fair to do—worthy of it, a more tangible recompense will surely follow. He has been complimented by capable critics, who will no doubt prove their first favourable impressions of the meter by a trial of its efficiency.

But to turn now to the general question as to the feasibility of employing the meter system for preventing waste. The discussion did not support *in toto* the author's views. No one denies that the universal measurement of water would be the best preventive; but that it is a practicable system, under the conditions ruling in this country, is contested by some of the highest authorities. This is an instance where the means would not be justified by the end in a district abounding in cottages and small houses. In such places, the cost of the meters alone would be prohibitive; but the first cost is not all. Besides the interest on the heavy capital outlay, there would be the expenses of maintenance (which is a more frequently recurring charge than in the case of gas-meters) and of inspection. Against all this, what has the water supplier to set out of the moderate rate charged for water in the case of small property? Obviously, if he is to derive a return from the service rendered, the meter system would entail an increased charge on the occupiers; and this would not be tolerated—at any rate, it would raise an outcry against which water-supplying authorities (especially the companies) could not stand. It would be said, and rightly, that the well-being of the community demands the continuance of the present cheap and abundant supply of water; but that well-being does not demand a waste of water. There comes the real difficulty. All householders do not regard it as any part of their duty to guard against the abuse of this necessity of life; and wilfulness and carelessness being, apparently, inherent qualities of some natures, it is essential for the suppliers of water, in their own defence and that of their conscientious customers, to stay its misuse. Therefore some preventive system is indispensable. Mr. Schönheyder says the best is to be found in the meter system; but, after carefully reading his paper and the discussion, we are driven to the conclusion that, from a monetary point of view, a good system of inspection has yet to be superseded in an ordinary residential district. The views expressed in the discussion by Mr. W. B. Bryan, the Engineer of the East London Water-Works Company, and by Mr. William Morris, the Engineer of the Kent Water Company, were particularly noteworthy.

The Action of Acetylene on Copper.—At a recent meeting of the Paris Academy of Sciences, MM. Sabatier and Senderens submitted a communication on the above subject. They showed that acetylene, when passed over copper heated to 200° C., undergoes a complicated transformation, giving a liquid hydrocarbon and a mixture of ethylene, propylene, butylene, ethane, and hydrogen. At the same time the copper becomes coated with a solid deposit, of the composition $(C_7H_6)_n$, to which the name of "cuprene" is given.

Expenditure by Local Authorities on Technical Education.—Last Friday a return was issued giving the amount spent on technical education by Local Authorities in England, Wales, and Ireland (with the exception of six who did not make any return), during the year 1897-8, with the estimated expenditure during 1898-9. It shows that in the former period the expenditure was £860,105; and that the estimate for the latter was £874,612. These amounts are exclusive of the sums allocated to intermediate and technical education under the Welsh Intermediate Education Act, 1889. The amounts raised by loan on the security of the local rates under the Technical Instruction Acts totalled in 1897-8 to £69,333; in 1898-9, to £133,583. The above-named total expenditure was divided thus: England (excepting Monmouthshire), £826,450; Wales and Monmouthshire, £28,006; Ireland, £5649. The estimated expenditure in England was £834,909; in Wales and Monmouthshire, £35,179; in Ireland, £4524.

The Retort-House Machinery of the South Metropolitan Gas Company.—We are asked by Mr. Livesey to correct two statements relative to the above which appeared in the last number of the "JOURNAL." Mr. Henry O'Connor, in the course of his Inaugural Address to the Society of Engineers, stated that "Mr. George Livesey was undoubtedly the first to adopt continuous coke conveyors, on a scale of any magnitude, at the Old Kent Road works." Mr. Livesey disclaims the honour thus accorded to him in connection with this innovation; his late brother (Mr. Frank Livesey) and Mr. Charles Tanner, the chief foreman, who has now retired, having, he says, done it all, "and must have the credit between them up to the system now in use—continuous wire-rope drawing trucks which can be attached and detached anywhere." With regard to the order for West's stoking machinery at East Greenwich, referred to on p. 348, Mr. Livesey says it is the wire-rope system which is found to be capable of doing more work than any other.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 423.)

A MUCH more cheerful feeling prevailed on the Stock Exchange during the early part of last week; and markets showed considerable firmness. But owing to subsequent disquieting news from South Africa, the full extent of the rise was not maintained. The settlement revealed a favourable position—there being apparently but a small account open for the rise; and stock in several markets proved scarce, while money was cheap. Investment securities were well maintained; their firmness being assisted by a rise of ⅛ in Consols, which were supported by the belief that the Government have no intention of making a fresh issue to defray the expenses of the war. The public are still acting with extreme caution, and fresh business is checked; but they are little disposed to change their investments. Dealings in Gas stocks have again been very quiet, beyond what was done in Gaslight ordinary, which has shown firmness during the week—the stock advancing 1, to 108-10; while dealings were recorded at 109¾. The dividend was taken off the price on Friday; and at the lower quotation business was done at 107. The secured issues were not much dealt in; but they maintain previous values. South Metropolitan and Commercial ordinary were also inquired for; but there was no change in prices. Transactions in the Suburban and Provincial group were rare, though a few dealings were recorded in Brentford, Crystal Palace, and Tottenham and Edmonton; but there were no quotable changes. Among the Continental Companies, the feature was the firmness of Imperial ordinary, which has advanced two points to 215-20. Respecting minor Companies, some inquiry prevailed for European, Malta, Monte Video, Bombay, and River Plate; but Ottoman receded slightly. As to Water stock, the past week has been very quiet; the only movements being a rise of two points in Lambeth 10 per cent. maximum and in New River shares.

In regard to the daily operations: They were fairly numerous on Monday; the dealings in Gaslight ordinary being most active between 108 and 109, while in South Metropolitan business was recorded at 134 and 134⅝. Brentford changed hands at 278½; and a special bargain was done in Commercial at 240. Transactions were recorded in Imperial Continental at 216½, European at 21, and River Plate at 10¾. Tuesday was very quiet; but a fair amount of business was done in Gaslight ordinary between 108 and 109, while Imperial Continental changed hands at 216½, Malta at 5⅜, and Monte Video at 11. In Water stocks, West Middlesex were done at 290. Wednesday saw a rise of 1 in Gaslight ordinary, to 108-10. Business was done for the new account at 109½; while the 4 per cent. preference marked 121¾, and the 3 per cent. debentures 100. South Metropolitans were done at 136 for cash, and 134½ for the new account. British Gaslight changed hands at 43¾; and Bombay new at 4⅜. As regards Water, New River new rose 2, to 425-30; but there was no business recorded. Apart from Gaslight ordinary, which was dealt in between 108¾ and 109¾, Thursday was a very quiet day; but a little business was done in Commercial new stock at 242, Brentford at 279, ditto new at 214, Buenos Ayres at 9 1/16, and Imperial Continental at 216½. There was not much doing on Friday; the only feature being a rise of 2 in Imperial Continental, which was dealt in at 216½. A fair amount of business was also done in Gaslight ordinary between 108 and 109; and a few dealings were recorded in South Metropolitan at 134 and 134⅝, Commercial new stock at 240, Brentford at 278½, and Buenos Ayres at 9¾. On Saturday, the market was quite featureless; but a little business took place in Gaslight ordinary between 106 and 107 *ex* div., and in the 3 per cent. debentures at 100. Crystal Palace ordinary changed hands at 125, River Plate 11, Commercial 309½, South Metropolitan ordinary 134¼, and Tottenham and Edmonton "A" 141, and ditto "B" 102.

ELECTRIC LIGHTING MEMORANDA.

Electricity Generation in Bulk—Various Bills in Parliament—South Wales, Tyneside, Lancashire, Durham, Jarrow, and Hebburn.

A GOOD deal of prejudice hovers over and against the electricity generation in bulk schemes which this year as last propose to take advantage of the general welcome already extended by Parliament to the idea. There is no reason to doubt that Parliament will consider all these new Bills and the opposition to them strictly on the merits, without being scared or influenced from doing what appears to be the right thing by the bogey of Municipalism or the underhand workings of any other vested interest. The very fact that powerful municipal corporations should stand in the way of any project for providing the public with something it had not before, is a striking indication of what the community lost when the local authorities forsook their original purpose of government and took to trade. At the same time, it must be allowed that a municipality is fully justified in opposing all mere company-mongering schemes for doing unnecessary things. If strange turns are given in our time to Municipalism, quite as remarkable things are done, or attempted, in the hackneyed name of electrical enterprise. Hence it behoves local authorities to be on their guard against electric wire-pulling, which is the only kind of imposition that remains to trouble town life nowadays. Not so long ago, town councils knew what it was to be badgered about sewage-treatment schemes by rival conjurers with incompatible claims to sole possession of the secret of turning sludge into sovereigns. These are all dead now. But the electrician is still with us; and his powers of prophesying and promising are artful enough to seduce many who know more about electricity than the average town councillor.

Electricity generation in bulk will have to make its way through Parliament on its particular merits. There are four Bills, for sanctioning as many schemes; the districts concerned being South Wales, Tyneside, Lancashire, and Durham. The first is apparently a respectable project, enjoying the support of Sir W. T. Lewis, Mr. John Cory, and other leading men of the district. It is proposed to acquire about 33 acres of land, in three lots, for generating stations in the counties of Glamorgan and Monmouth. The capital of the Company is mentioned as £750,000, with power to borrow one-third of the amount of share capital issued. The sum of £100,000 is to be subscribed before the compulsory powers of land purchase are exercised; and if this amount is not so raised, and £50,000 spent upon the undertaking before five years have expired, the Act is to lapse. The area of supply is to be the whole of the county of Glamorgan and part of Monmouthshire, including the county boroughs of Cardiff, Swansea, and Newport. The Company will not supply electricity except to wholesale consumers within the electricity supply limits of any local authority, unless with consent. The Company disavow any desire for monopoly. The Bill explains how the Company propose to deal with local authorities. Wholesale consumers, with whom the Company propose to deal directly, are such as will engage to use not less than 20,000 units per annum. The Company are willing to take a sliding scale with a standard price of 2½d. per unit, and a standard 10 per cent. dividend, rising ¼ per cent. for each one-twentieth of a penny by which the actual average price for the year shall have fallen below the standard price. Back dividends are expressly provided for. A 10 per cent. reserve fund is to be formed out of surplus profits over the statutory dividend, after which all excess profit is to be carried forward to the credit of the divisible profits of the following year. Quarter Sessions are to be empowered to see to the carrying out of these provisions, on the petition of two consumers, who are to be made liable for costs if their action is groundless.

The Tyneside Company is another venture which puts forward some very well known local names for its sponsors, to whom is added Mr. C. A. Parsons, of steam-turbine fame, and Mr. A. A. Campbell Swinton, the electrician. It is proposed to take sites for stations at Wallsend, Hebburn, and Whickham. The capital is £500,000 with one-third borrowing powers; and £100,000 is to be subscribed before the compulsory powers are put in force. The proposed area of supply includes the city of Newcastle-upon-Tyne, the boroughs of Gateshead, South Shields, and Tynemouth, and a large outlying district. The Company will not supply electricity generally within the city of Newcastle; nor do they claim a monopoly. The arrangements proposed to be made with local authorities differ considerably from those of the previous Bill. This Company also suggest a sliding scale working one way, under which they undertake to pay 10 per cent. dividends out of electricity sold at or within 5 per cent. of scheduled rates. For every 5 per cent. of average reduction of price, the dividend is to be increased by 1 per cent.

The Lancashire Electric Power Bill is to incorporate a Company in which Mr. R. P. Sellon, of accumulator fame, is the representative electrician, with a share capital of £3,000,000, and power to borrow one-third. This capital is to be at the disposal of Directors with a £500 qualification. The compulsory powers subscription is £100,000. The generating stations are to be at Aspull, St. Helens, Little Lever, and Davyhulme. The area of supply is to be all of Lancashire south of the Ribble, without monopoly. Generally the Bill resembles the previous measure, the Parliamentary Agents being the same. The last of the group of Bills relates to the county of Durham; and the first Directors include the electricians Garcke, Raworth, and Sellon. The scheme is the most modest of all; the capital being only £270,000. The area of supply is to be co-extensive with the districts of the Poor Law Unions of Gateshead, South Shields, Chester-le-Street, Sunderland, Houghton-le-Spring, Durham, Easington, and Hartlepool. For safety, the Company's system of supply is to be passed by the Board of Trade. There is no guaranteed subscription of capital before the exercise of the compulsory powers to purchase land. The generating stations are to be located at Gateshead and Harraton. It is not difficult to perceive that these different measures have unequal prospects of becoming law. The Walker and Wallsend Union Gas Company are in the field with a scheme of their own for the general supply of electricity to Jarrow and Hebburn, with a special capital of £250,000. Altogether, the parliamentary situation created by these various schemes is a very interesting one, and can hardly be cleared off without adding considerably to the available stock of knowledge respecting electricity generation in bulk.

In our "Register of Patents" to-day (p. 405), there appears a full abstract of a patent taken out last year by Dr. H. G. Colman, the Chemist at the Saltley Gas-Works of the Birmingham Corporation, relating to the treatment of coal and other illuminating gas during condensation, with the object of obtaining increased illuminating power and a more complete removal of naphthalene.

THE PRESS AND THE SCARCITY OF COAL.

We are daily receiving fresh evidences of the fact—upon which we have often found occasion to comment—that, if one chances to possess an intimate acquaintance with any event or topic of the day, the discrepancies on points of fact, and ignorance of elementary truths to be observed in the reports and comments of all but the very best of the general Press, creates a wholesome incredulity as to the accuracy of their accounts of occurrences of which one has no first-hand knowledge. We do not refer to the newspaper comments on the war—though no better instance could be quoted—but to the references, daily becoming more frequent, to the scarcity and high price of coal.

Some of the most brilliant specimens of careless reading and loose thinking were enshrined in an article published in the "Financial Times" last Thursday, entitled "Gas *versus* Coal." The article was based upon the half-yearly reports of the two great London Gas Companies; and attention was naturally called to the increase in the quantity of gas sold last half year by both undertakings. The consumers supplied by the Chartered Company will, however, be surprised to learn, on the authority of our contemporary, what is the reason for that increase. "In view of the fact," we read, "that substantial reductions were effected by each of the Companies in the charge for gas, although the price of coal increased to an abnormal extent, it was only to be expected that a number of people would alter their domestic arrangements accordingly." Even were the adjective "substantial" one that could fitly be applied to a reduction of 3 per cent. in the price per thousand feet, the fact that such reduction (the first made by the Gaslight Company since they raised the price in 1898) only came into force on the first day of the New Year, and will not be noticeable by the bulk of their consumers until they receive their accounts next April, completely destroys our contemporary's argument. It was rather the increased cost of coal, not the decreased charge made for gas, that brought about the altered domestic arrangements of the Gaslight and Coke Company's consumers.

If, however, the public were surprised to hear of the "substantial reduction" in the price of gas north of the Thames, how much greater must have been the astonishment and amusement of the Horseferry Road authorities to read that "Colonel Makins, at the meeting of the Gaslight and Coke Company, held last week, stated that that concern had sufficient coal in hand to last until next June." The South Metropolitan Company, however, we learn, are not so fortunate. "Their supplies in hand are much smaller than those of the other corporation." They, we suppose, have only a couple of months' consumption in stock. And this is the sort of stuff upon which the general public have to base their opinions! As Colonel Makins, in his recent speech, declared that the stocks of his Company were "lamentably low," we wonder how many million tons our contemporary imagines that the Company would have in hand if their stocks were normal.

A further contribution to the discussion of the coal difficulty is that provided by the "Westminster Gazette," who ask: "Why is it that we do not make more use of anthracite coal? It is claimed for it that it is very smokeless, and that its heating power is one-third more than the ordinary Welsh coal. It is true we should have to alter our grates and fire-bars to burn it; but, since things have got to the present pass, maybe we shall have to do even that." It is news to us, at any rate, that "ordinary Welsh coal," by which is understood steam or anthracitic coal, and the supply of which is at present insufficient to meet the demands of the industries which consume it, is commonly used in grates instead of "household. It is sometimes contended that gas-fires are not "home-like;" but fancy making merry round an anthracite fire!

Another daily paper—one rapidly achieving a reputation for short-sighted views and day-to-day opinions—announces, with its characteristic air of settling everything out of hand, that "for thirty years scientists have foretold a coming coal famine. To-day the famine has arrived." Writing a fortnight ago, we said that "if, by saying that there is no scarcity of coal in this country, nothing more is meant than that the mines are far from being exhausted, no one will be found to contest the obvious truism." But we reckoned without the "Daily Mail." The predictions of an approaching coal famine by scientists thirty-five years ago—not "for thirty years," the Coal Commissioners changed all that—were based solely upon a belief that the coal resources of the country were rapidly ebbing away. That the present scarcity is not due to any such cause, anyone could discover by reference to those predictions, to the report of the Coal Commission, and to the statistics of the output of the coal mines during the past thirty-five years. In order, however, to save our readers a somewhat laborious task, we have in type for early publication the first instalment of an article supplying a digest of that information. In commenting upon the "profusion of hypothetical and often of contradictory explanations" of the present shortage of coal, "The Times" recalls the story that during the Crimean War an old lady who was sorely puzzled by the enhanced price of candles inquired at the village shop if the battles were fought by the aid of candle light. Some of that old lady's daughters must, we are very much inclined to think, have taken to journalism.

A GOOD BEGINNING FOR THE YEAR'S TRADE.

The Board of Trade returns for the month of January show plainly that the end of the trade revival is not yet. Indeed, they rather indicate that we have not even reached dead-high water; for—although we are, of course, now comparing with 1899, which was throughout a year of advancing prosperity—the value of the imports and exports for the first month of the year was very considerably higher than for the corresponding period twelve months ago. The imports, exports, and re-exports during January reached a total of 73½ millions sterling, as compared with 66½ millions in 1899—an increase of no less than 10 per cent. Such an increase, after taking into account that there was one Sunday less in the month this year than last, can only be regarded as a remarkable proof of the buoyancy of trade, and as a cause for much congratulation on the part of the country as a whole, coming as it does at a time of such unusual and heavy drains upon her material resources.

It is impossible to keep references to coal out of any article discussing the condition of trade; and the following figures, being the exports of coal, coke, and fuel in the month of January for this and the two preceding years, are well worth recording and considering:—

	1898.	1899.	1900.
Quantity . .	2,909,807 tons	3,032,343 tons	3,087,532 tons
Value . . .	£1,320,767	£1,527,195	£2,238,332

The statistics for the metal and engineering trades are also striking. The total value of all metals and articles manufactured therefrom (including machinery) in the past month was £5,268,095, as compared with £4,166,917 in 1899, and £3,844,372 in 1898. England, as a trading nation, is certainly not yet effete.

A ROYAL COMMISSION ON MUNICIPALISM.

The report of the Royal Commission on Water Supply within the limits of the Metropolitan Companies, of which a very full abstract has been given in the "Journal," possesses, of course, supreme authority as an answer to the particular questions referred to the Commissioners. As such, it must be allowed to speak for itself; and everybody interested in the subject of the reference will naturally procure a copy of the Blue-Book for his own study. Here, however, we propose to discuss the report in its more general character of a criticism of the popular doctrine of the saving virtue of Municipalism as a principle of administration of public supply undertakings. It is one of the signs of the times in which we live that the cry for municipalization of all such undertakings is the rallying call for many British citizens who rightly take an interest in the work of local self-government. It is rather beside the immediate question to touch upon all the aspects and consequences of municipal trading, as a branch of municipal business distinct from, and even antagonistic to, the original purpose of local self-government for which municipal bodies were created. Suffice it to concentrate attention for the present to the clearly-defined and popularly-held view that the municipalization, by purchase, of local supply undertakings actually carried on at a profit by private enterprise, is always and everywhere expedient and desirable. This is the point: The popular cry for Municipalism, raised as a test of Progressivism in municipal politics, is based on the principle; and this, of course, is regarded as of universal validity. Those who uphold it do not entertain the possibility of there being any doubt as to the merits of particular cases. If they did, there would be no principle to contend for, much less erect into a touchstone of politics. Everybody, whatever his political views or prejudices, agrees that there may be cases for government action in providing services for which private enterprise is inadequate or unavailable. But to admit this is not Progressivism, which is nothing if not superior to considerations of mere expediency on merits. The question of expediency as regards municipalization is settled in advance, in Progressive municipal politics, by *à priori* consideration. This is no fancy sketch. It is the popular opinion, and it is acted upon sometimes to the extreme of municipalizing something which is acknowledged to be a burden on the ratepayers, rather than permit private enterprise to try the venture on a commercial basis; the magic circle of municipal trading undertakings must not be broken, even though its completeness and its enlargement may not be economically justifiable.

As yet, it is safe to say, this extreme devotion to the principle of Municipalism is confined to the official and journalistic Progressive mind. It is not shared by the general public, even of those ratepayers who are disposed to side with the "advanced" party in local politics. What makes the unofficial public municipalizers is the delusion, industriously spread by the party leaders, that this principle always pays, and pays well. They are assured that the way to get cheap gas, cheap water, cheap electricity, cheap telephones, is by municipalization; and the enthusiasm of the heedless ratepayer is further excited by the assurance that by municipalization not only will the particular service be cheapened, but also, in addition, there will be a handsome surplus profit made which will be available to substantially reduce the rates and help materially to improve the locality. The most highly educated, as well as the most stupid, of owners and ratepayers are caught by this bait. It was trailed very

successfully lately through the Metropolitan Parish of St. Marylebone, in connection with local electric lighting affairs, and hooked some very warrantable fish.

Now, the only way by which the British public can be restored to the ordinary common-sense position in regard to Municipalism is to nail the principle to the facts of every suggested application. To attempt to fight the principle, would be beating the air. Its upholders will always be able to point to many brilliant examples of Municipalism *in excelsis* in actual operation in the United Kingdom. Granted; but these illustrations, where they are supposed to justify the principle, really exemplify the necessity of basing every instance upon actual expediency in fact. Those who have the true interest of the ratepayers at heart, will refuse to accept the sentimental plea of the principle, without inquiring how the circumstances and conditions of the case work out. This is a duty for the public and for intelligent public men, and is no concern of the "interests" which are sometimes alleged to be always opposed to Municipalism. Quite the contrary, most "interests" have no rooted objection to being bought up at what they consider a fair price. How the bargain turns out afterwards for the ratepayers, is no concern of theirs. The electric light companies, for example, all over the country have been municipalized by Progressive local politicians, who were at first very proud of their part in these performances. This satisfaction has not in every case proved of an enduring quality.

The proprietors of statutory supply undertakings of the more permanent order—as gas and water undertakings, which are freehold property—have frequent reason to complain of the conduct of the baser sort of would-be municipalizers. These ardent gentlemen, while professing to act "on principle," have a way of showing their knowledge of the grounds upon which the question of the expediency of municipalization is determined by doing all they can think of to depreciate and damage the property they covet. Thus the gas supply that is to be municipalized is commonly impeached as bad, inadequate, and dear; while the water undertaking approached in the same spirit is always condemned in advance. The most advanced of "Forwards" in a municipal corporation is rarely superior to this infantile strategy. Where, however, the question of municipalization is put into respectable hands, as was the case not long ago with the gas supply of Liverpool, the much-lauded "principle" is liable to be stripped very naked and bare. So naked, indeed, that its most devoted sponsors are ashamed of it.

Assuming that this unworthy trick of besmirching the object of municipal longing is not perpetrated, how is the question of expediency to be tested? The final report of the Royal Water Commission shows how; and it is for this that we cite it here. The Commissioners started from the datum of the report of the Duke of Richmond's Commission, 1869, which expressed the opinion that the water supply of London should be under public control, and entrusted to a responsible public body. Other potent considerations to the same effect were laid before the Commissioners, as well as opposite views as to the principle The Commissioners forthwith declared that it was no business of theirs to decide between these "views of public policy," but only to determine the expediency of purchasing the undertakings in the interest of ratepayers and water consumers, on financial grounds, and with regard to the future as well as the present requirements of the district. This means that the principle of municipalization was made to wait upon the demonstration of the expediency of the operation, on the merits. Then we get a heavy tussle with facts and figures which need not be followed here, except for the net result. The first consideration to be established was that the debenture and mortgage debts of the undertakings would have to be taken over as they stand, in accordance with precedent. The preference stock, although not quite so well secured as the debenture stock, was ranked immediately after, and with the latter as an initial charge upon the property. All these interests had to be deducted from the revenue before the amount of gross profits available for the purchase could be arrived at. The next question is that of how the price of the undertakings is likely to be fixed. This is a difficulty. In the particular case in point, the Commissioners found that the London County Council were not prepared to go into an arbitration with the Companies on ordinary terms under the Lands Clauses Act, for reasons which the report gives at length. Much interesting matter comes out in the course of the explanation; but this is not to the present purpose. The report concludes this part of the inquiry with the weighty declaration that there is nothing in the circumstances to warrant departure from the usual course of arbitration under the Lands Clauses Act. Consideration number two!

How is such an arbitration likely to result? The London County Council have been afraid to look the matter in the face. The two parties, naturally, would not commit themselves by naming their figure; so that the Commissioners had to make the best guess they could at the probable price—going to work in the way of an arbitrator guided by actual law and practice. This is a highly informing exercise, and incidentally demolishes several of the pet fancies of municipalizers "on principle." Mr. Dickinson, the Chairman of the Water Committee of the London County Council, has named 30 millions sterling as the minimum value at which any arbitrator might be expected to assess the Companies' property (this was in 1894); and although he subsequently tried to run away from his own figure, the Commissioners found this was only possible by virtue of taking certain impossible things for granted. So far as the purchase of the share capital is concerned, however, the Commissioners do not see much in it, either way. Doubtless, there would be the traditional advantage of the purchasing authority being able to raise the money at a lower rate of interest than the rate taken by the arbitrator for the water-income; but this might easily be wiped off if anything were allowed for prospective income and compulsory purchase. After this comes the very serious question of the sinking-fund, which would be a heavy additional burden, even if Parliament spread the period of repayment over a hundred years. It is argued, for the purchaser, that this charge would be recouped by the economies of public management. These are the familiar savings (in prospective) of directors fees and staff and office expenses. As the Commissioners acutely observe, these economies are not so often realized as expected. Municipal management costs more than company management, and is apt to be less efficient. This part of the report is extremely suggestive reading. The following is the conclusion respecting the prospect of economies: "Taking maintenance and management together, we have come to the conclusion that the saving by a purchasing authority will not be large, and that this set-off to the cost of a sinking fund may be almost entirely disregarded." There goes one plank of the municipalizers' platform!

There remained a gross water-income estimated at £1,300,000 a year to be purchased, as from 1901. The net revenue after paying loan and preference interests would not exceed £980,000, which would suffice to pay interest and sinking fund on 25·27 millions, or 27·87 millions, or 29·51 millions, according as the term of repayment was 60, 80, or 100 years. Would this capital satisfy the present owners? Plainly not. All the competent authorities consulted agreed that purchase of the property on fair terms would be financially disadvantageous to the ratepayers and the consumers. Other advantages were scarcely even claimed. The opinion formed by the Commissioners was strengthened by what they were able to learn of the recent results of water supply municipalization in a number of provincial centres. Upon these returns, the Commissioners conclude that there was no evidence of superior economy of corporation management over company management, or that the charge for water on the community, as a whole, is lessened by corporation management; "although corporations have the advantage of being able to distribute the burden of the water supply between the consumers and the ratepayers, and of charging higher rates on districts outside the borough area, where they have to supply any such districts." Here it seems the municipalizers' platform collapses altogether. Municipal water supply has always been held up as the first stage of progress in local government beyond mere executive and sanitary duties; and it is not justified in comparison with the working of the London Water Companies! The quality of expediency, at any rate, disappears from the agitation kept up by the London County Council for the purchase of the Companies' undertakings.

THE VENTILATION OF TAR AND LIQUOR STORAGE TANKS.

From time to time, reports appear in our columns of explosions of a minor or more serious nature in connection with tar and liquor storage tanks; and, apart from the reports of such matters, it is well known that mysterious occurrences do take place in connection with these tanks without any information being forthcoming. Manhole-lids have been blown off, and even the tops of the tanks considerably shaken, together with other damages, without the cause being accurately ascertained. The liability of accidents from these tanks is well known, and does not need emphasis; but some allusion to the general question may be permitted—following up the letter by Mr. E. A. Harman, of Huddersfield, appearing in the "Journal" for the 23rd ult.

Generally speaking, such accidents have taken place during either the repair of the tank, or of some apparatus in connection therewith. It will be recognized that, when the tanks are full of liquor, there is no danger; it is when they are nearly empty of liquor, and the upper portion full of gas, that the maximum danger exists. The explosive nature of the gases, under certain conditions, has been chemically and practically proved. It is a common practice to have a manho e-lid partially open, through which samples of liquid are taken from time to time for testing. The dividing-line between the tar and liquor is also ascertained through the manhole. This line is variously obtained. In some works, a piece of gaskin is fastened to a measured gauge-rod, which is dipped to the bottom of the tank. When withdrawn, the tar adhering to the gaskin indicates appproximately its depth; and this being deducted from the total depth of liquor in the tank, leaves the quantity of ammoniacal liquor remaining.

Some engineers prefer to have a series of small cups fastened on the gauge-rod; an examination of the contents of the cups revealing the dividing-line. Others prefer a single cup fastened to a gauge-rod, and let down tentatively until the cup contains a small quantity of tar—the measurement upon the gauge-rod enabling the subsequent calculations to be made. But, whatever method is adopted, the manhole must be open for a short time for the purpose. Sometimes a china float is fixed in connection with a measuring rod; so that the total contents of the tank can be seen at a glance. The necessary opening through the

top of the tank for the gear-work or rod as the case may be, is generally a little larger than the parts working through it; and hence a little ammonia gas is lost in this way.

The fundamental question which is of importance to all gas-works undertakings, is whether the ventilation of such tanks is desirable or detrimental. Ventilation necessarily involves a considerable loss of ammonia. It might justly be argued that if ventilation providing for evaporation is desirable, wherein lies the use of building expensive arches and providing girders for the covering of the tank? The idea of ventilation is suggestive of a pressure of gas accumulating in the tank; but this, it is well known, does not exist. If pressure or vacuum be a cause for anxiety, this can be easily overcome by providing a water-gauge in proximity to the tanks, where a casual observation would give the conditions obtaining in the tank. During pumping operations, it is desirable to have the man-lid open a little way, in order to provide for the displacement of the liquor by air; although the man-lid, not being a gas-tight one, generally provides an ample inlet.

The dissemination of such gas about a gas-works or district is eminently undesirable. Ammonia gas is well known to leave a bluish tint upon everything it comes in contact with, to the disfigurement of buildings and plant. And, however beneficial infinitesimal doses of ammonia may be, it has not yet been claimed that a large quantity freely distributed is conducive to health. Indeed, the ammoniacal odour about a well-conducted gas-works is generally the signal for an examination of the plant and apparatus concerned, with a view to the arresting of the loss taking place.

The subject of ventilation is one upon which even eminent gas engineers are divided. Some affirm with considerable emphasis that ventilation is desirable; while others denounce it as being too ridiculous to consider. All tar and storage tanks should be enclosed by a handrail preventing the storage of any material thereon, or indeed the passage of carts, vehicles, or pedestrians over them. Further than this, a clearly defined "Caution" should be placed on the tank, to the effect that under no circumstances whatever must a naked light be taken across the same or used in connection therewith. Any desired restrictions may be added to suit the ideas of different engineers.

In the case of anyone wanting to ascertain the quantity of liquid in a tank after daylight, a safety-lamp should be used for the purpose. Electric lamps, too, are now being used about some gas-works where there is any liability of danger. Indeed, as these articles get cheapened, they will probably be of great use where explosive gases are concerned. An open grating on the top of a tar and liquor storage tank is sometimes used; and ventilating shafts have also been provided, carried some little height above the tank.

The object of ventilation has, however, not yet been made apparent; and the subject is one which might worthily form a topic of discussion at one of the meetings of the Institution of Gas Engineers, the Gas Institute, or one of the District Associations—apart from a paper being read thereon.

VARIOUS SPECIAL BILLS FOR 1900.

THERE remain for notice, as forming part of the parliamentary programme of the session with which the gas or water interests are directly or consequentially concerned, certain Bills which do not come into any ordinary classification.

The City of London (Various Powers) Bill aims, with other objects, at the making of further and better accommodation for the laying of pipes, wires, and other apparatus in, over, or under streets, and the conferring of further powers upon the Corporation with respect to the control of streets and structures across streets, and the fixing of apparatus for public lighting in streets. The preamble refers to the prospective operations of the National Telephone Company and the Charing Cross and Strand Electricity Supply Corporation in breaking open all the main thoroughfares of the City, and declares that, owing to numerous other statutory powers enjoyed and exercised by other undertakers for doing the same thing, it is difficult to find room in some streets for all the pipes and wires. Therefore the Corporation desire power to provide and maintain proper and sufficient accommodation (called public service works) for this class of property. Part 6 of the Bill accordingly proposes that, with the consent and approval of the Board of Trade, the Corporation may make such public service works as may be necessary and expedient. These works may be carried through and across all underground cellars and vaults that may be found in the way; as little damage as possible being caused, and any damage wilfully or negligently done being fully compensated. All such public service works are to vest in the Corporation. Provision is made for the removal of pipes and wires into the public service works when made—new ones as and when required to be laid, existing ones to order of the Corporation and at their expense. There is to be a charge for the use of the public service works; but in the case of gas and water pipes in the streets by statutory right, the charge is to be based only on the saving (if any) resulting to the Company by reason of the pipes being laid and accessible in public service works, instead of being buried. Where public service works exist, the powers of Companies to break up streets are to cease. All pipes in these works are to be kept in proper order by their owners, under the supervision of an officer of the Corporation, who are to be responsible for the ventilation and drainage of the works. The administration of the public service works is to be in accordance with bye-laws to be approved by the Board of Trade. Provision is made for fixing the liability for accidents. A clause proposes to give the Corporation power to affix apparatus for public lighting to the external walls of any building in the City. The expenses of carrying out the provisions of the Bill are to be raised by a loan on the security of the consolidated rate or the sewer rate.

The London Water (Purchase of Companies) Bill is to empower the London County Council to acquire the undertakings of the London Water Companies. It is stated in the preamble that some of the Companies were established by Parliament in consequence of popular dissatisfaction with the quality of water supplied and the prices charged by the older Companies (the New River, Chelsea, and Lambeth Companies), with the object of making the supply competitive. The East London Company were also empowered to supply in part of the New River district. The Companies, however, subsequently entered into mutual arrangements, and refrained from competing among themselves. It is declared that, as a result of these combinations, the ordinary domestic consumer is generally charged the full maximum rate, which varies in different districts, but is always levied on the rateable value of the houses supplied. The rest of the preamble refers to proceedings taken since 1892 to deal with the water supply of London, and declares that the London County Council have come to the conclusion that, for financial and other reasons, it is desirable to adopt the policy of acquiring the undertakings of the Companies. Wherefore, the preamble states that, "in order to avoid further delay in finally settling the question of Metropolitan Water Supply, it is expedient that provision should be made for forthwith placing the undertakings of the Companies in the hands of the Council." Clauses of the Bill provide for the transfer of the undertakings by agreement; or, in default of agreement, by arbitration in accordance with special provisions. The purchase price is to include the cost of reinvestment. Otherwise the arbitrators are to exercise their absolute and unfettered discretion in arriving at the fair and reasonable value of the property, after considering all the circumstances and contentions of the parties. The Council and the Companies are to be empowered to enter into, and carry into effect, any agreement for the issue and acceptance of stock annuities in discharge of the consideration for transfer. Retiring officers are to be compensated. The Staines Reservoirs Joint Committee are to be dissolved, and the property vested in the Council. All the Companies' systems are to be combined for equalizing the supply over the Metropolitan water area. The Council propose to take powers to appoint a Committee of Management, which may include non-members of the Council. Extra-Metropolitan Councils are to have powers to acquire their portions of the undertakings, and to act as water authorities. The schedules of the Bill give the parliamentary status of the several Companies.

The London Water (Welsh Supply) Bill declares that the works of the eight Water Companies are inadequate to provide for the prospective requirements of the population within the Metropolitan water area, and that it is expedient that the scheme described in the Bill should be sanctioned. This comprises the construction of reservoirs for collecting the waters of the Rivers Irthon, Towy, Doethie, and Wye; a service reservoir at Borehamwood, in Hertfordshire; and the main and distributing aqueducts. It is desired to acquire the necessary protection lands. The lands are to be acquired within seven years, and the works completed within twenty years. Compensation water is to be provided as regards four streams. The capital expenditure contemplated is £18,100,000, repayable in sixty years.

The Metropolitan Water Companies Bill is to confer further powers upon the Local Government Board, and to impose further obligations upon the Metropolitan Water Companies with a view to providing for the future needs of London in regard to the supply of water. The object of the Bill is to enable the Local Government Board to arrange for the construction of additional storage reservoirs in the Thames Valley, as these may from time to time be required to enable the Water Companies to fulfil their engagements. It proposes, in effect, to develop without limit the scheme of storing and husbanding the flow of the River Thames, of which the Staines reservoirs are the first instalment. The cost of the works is to be provided by issues of unredeemable debenture stock. All schemes under the Bill are to be submitted by the Water Companies interested, to the order of the Local Government Board.

The Chelsea Water-Works Bill is to empower the Company for the general purposes of their undertaking to purchase by agreement and hold 100 acres of land. A certain creation and issue of shares to the nominal amount of £34,215, converted into stock (as to the legality of which doubts have been expressed by the Official Auditor), is to be made valid. A further sum of £20,000 of redeemable debenture stock is to be issued. Special clauses are inserted for dealing with the situation created by the Official Auditors' delay in passing the accounts.

The East London Water Bill is to authorize the Company to construct additional works, including two storage reservoirs at Waltham Abbey and Chingford, Essex, for collecting the waters of the River Lea. The works are to be completed in

seven years, subject to clauses protecting the Lea Valley Drainage Commissioners and others. Arrangements are proposed for enabling the Company to temporarily increase their powers of taking water from the River Thames, with the sanction of the Conservators, and without detriment to the interests of the other Companies enjoying equal privileges in this respect. Molesey Weir is to be adapted to the measurement of the flow of water over it. Mutual arrangements for assistance are to be made between the Company and the other Metropolitan Water Companies, under the direct sanction of the Local Government Board. Additional debenture capital to the amount of £1,800,000 is required, redeemable in the customary manner for London Water Companies.

The Lambeth Water Bill is to enable the Company to construct an additional reservoir at Molesey, with the necessary subsidiary works, within fifteen years. More Thames and gravel water is to be taken for the purposes of the Company's undertaking, under particular conditions applying to the flow of water over Molesey Weir, and subject to certain payments to the Thames Conservators. The Company desired to raise additional debenture stock, redeemable at par in 25 years, to the amount of £750,000.

The London Sea Water Supply Bill is to enable the Company to increase their share capital by £400,000, and to borrow £100,000, for the purpose of reviving and extending the undertaking authorized in 1896, but not apparently carried out.

RECENT PUBLICATIONS.

The Local Government Annual and Official Directory. Edited by S. E. Rogers. ("The Local Government Journal.")

The ninth issue of the above-named publication contains many new features, including the charges made for gas and water by the London Companies and by those supplying gas in the suburbs, and also the names of the officials. It is to be regretted that the information given on these matter is not quite so up to date as we trust is that furnished in regard to other subjects. For example, the price charged by the Gaslight and Coke Company is put down at 3s. instead of 2s. 11d. per 1000 cubic feet; and there have been some official changes which are not recorded. The Directory contains abstracts of 14 Acts of Parliament affecting local government which were passed last session, as well as a number of short articles and paragraphs dealing with this subject. This section of the book is called "The Local Government Companion," and among its features are memoranda for members and officials, points about Parish Council law, information respecting the growth and cost of electric traction, the legal decisions of the year affecting local government, facts about the Local Government Board and its work, and figures bearing upon municipal rating and finance. The Directory portion, which the Editor says has been "officially revised and brought up to the latest possible date," contains the names of the chief officials of the public bodies in England and Wales.

The Wonders of Modern Mechanism. By C. H. Cochrane. (J. B. Lippincott Company.)

The author of this compilation has attempted to supply the public with an account of the results obtained within recent years by engineering and mechanical science, and a forecast of the achievements of future research, more accurate than those furnished by the newspaper Press, and less detailed than the descriptions given by technical journals. He has succeeded, we fear, in being sufficiently technical, in many of his articles, for his book to fail of appreciation by the general public; while the subjects are, of course, dealt with in too general a manner to interest, or at least to inform, those acquainted with any particular branch of mechanical science touched upon. It is a pity the author did not steer more successfully clear of technical detail, as, freed from that defect, his work would be calculated to engage the attention of, and stimulate a desire for knowledge in, those with a bent towards mechanical engineering.

It would be quite impossible, in a review of reasonable length, to examine and criticize the writer's description of the many and varied achievements of mechanical science, or to consider his pronouncements upon their respective value and future. He includes in his survey some two hundred subjects, ranging from bicycles to battleships, and from sugar-refining to the Suez Canal. In regard to the question of artificial illumination, Mr. Cochrane, who is an American, prefers water gas to coal gas, acetylene to water gas, and electricity to any of them, as the source of light. In his preface, the author pours scorn upon the knack which newspaper writers undoubtedly possess (on the other side of the Atlantic even more markedly than on this) of claiming for each newly-announced invention the most extravagant and impossible results. He, however, is himself by no means free from undue optimism in his estimates as to the probable future of inventions that have been, or are about to be, made by his fellow-countrymen. He has evidently an unbounded faith in the ingenuity of Edison and of Tesla, who are periodically announced to have invented some means of annihilating armies and fleets by the touch of a button several hundreds of miles distant, or some other world-staggering triumph of mechanical science. Far be it from us to minimize the extent of their actual achievements; but it is a mistake for their countrymen to be constantly heralding the birth of unhatched swans—they have more than once come out geese. We do not, therefore, tremble when our author speaks confidently of the time "when we shall buy calcium carbide as we now buy coal, only at about double the price; and it will furnish us [with] light, heat, and power at about one-fourth the present cost. Doubtless gas companies will soon take to furnishing it in the mains to consumers, though its easy liquefaction makes it so suitable for household use that it may eventually kill off the coal-gas industry altogether." We have heard of another property of acetylene gas which, if that illuminant were generally adopted for household use, might end in its eventually killing off the consumers altogether.

The author has also unbounded faith in the possibilities of liquid air—"a new motive fluid that promises to supplant the steam-engine, and give almost costless power, cold, heat, &c." In this field, Charles E. Tripler is the hero who "has stated" what he can do. He "claims" to have accomplished this, that, and the other, but is not, we notice, said to have proved that he can do any of them. Among the supposed *faits accomplis* is that which is "to all practical purposes perpetual motion. It is not perpetual motion, however, since it uses a natural force—the sun's heat—in expanding the air that drives the machine." This is modesty, indeed!

Among other chapters dealing with subjects interesting to "JOURNAL" readers, we may mention that on "Coal-Handling Machinery," in which the latest American contrivances are briefly explained—chiefly the apparatus manufactured by the C. W. Hunt Company, for which much is claimed. At the end of the chapter a recently suggested plan of conveying coal is described. The conveying is to be done by "pulverizing all the coal at the mines, and sending it through pipe-lines by a flood of water. Coal is very little heavier than water, and can be carried along readily. On receipt, it is proposed to subject the powdered coal to hydraulic pressure, moulding it into lumps of any desired size. If this shall prove feasible, the methods of coal-handling may be changed entirely; and the railway monopolies that now control the output of coal may give way to a pipe-line monopoly that will strive to emulate the Standard Oil Company." We really do not think Mr. Cochrane can mean us to take this as a serious suggestion. It is either a good joke (Fancy Beckton turning on the coal tap from Seaham Harbour!) or a reflection upon the intelligence of its author, and of anyone who thinks it of practical value. We have said what we think is the defect of the descriptions of what has been accomplished; we must add that we infinitely prefer them to the author's prognostications of what may be achieved. At the present time such of the general public as may look through this work will probably be most interested in the records and forecasts contained in the chapter on "Guns and Armour." That is, however, beyond our province.

A SCHEME OF RURAL SANITATION.

ALL things come to an end, and the indefatigable Special Commissioner of the "Daily News" has, at length, penned the concluding article of his interesting series on "Rural Sanitation" and cognate topics. The subject, more particularly in connection with the problem of village water supply, is one which appeals to many readers of the "JOURNAL;" and we have already taken occasion to touch upon some of the leading features of the Commissioner's campaign. It has been abundantly proved that there are scandalous shortcomings in the system, or lack of system, which at present obtains in respect of village sanitation. The disease granted, it is imperative to find a remedy; and to that end the Commissioner has now propounded "A Rural Programme." Unfortunately, a programme of legislative reform has been proved by experience to be a thing full of peril and pitfalls; and, cordially as we sympathize with our contemporary's zealous efforts in a worthy cause, we dare not hold sanguine hopes that the prescribed remedy will be promptly available or wholly efficacious if and when introduced.

The first step, says the writer of the articles, must be the repeal of the special disabilities under which rural districts suffer, and the raising of their building powers to the same terms as those now possessed by urban districts. It is suggested that "there is no conceivable reason why the ridiculous difference should ever have been made." For our part, however, with some knowledge of the men who bear rule in village communities, we can well imagine that reasons exist for making the exercise of their statutory powers conditional. Indeed, it appears to us that it is in this respect that the Rural Programme somewhat misses its mark. Methods must depend upon the men. It is of little use to change the methods if the men retain their old characteristics; and since no Rural Programme can reform human nature, the difficulty of changing a time-dishonoured system may well daunt the spirit of the most ardent reformer. In truth, anything like a drastic and sudden revolution is altogether out of the question. Reform is only possible within the limit of practical politics; and though that is by no means an argument for letting ill alone, the position does distinctly call for gradual amelioration, rather than for any sweeping attempt to correct abuses.

The fabled king kept 3000 oxen for thirty years in stalls that were never cleansed. Hercules, as we know, cleansed the stable in one day by diverting the course of two rivers. But the Special

Commissioner of the "Daily News" is not Hercules; and the two rivers are not available. The Augean stable of rural insanitation cannot be wholly cleansed in one day, or in many days; and we greatly doubt whether the cleansing process would be expedited by conferring new or unrestricted powers on District Councils. But though, so far, we doubt the efficacy of the Rural Programme, and regard the Special Commissioner's vision of simplified legislation as a fond thing vainly invented, it is far from our wish to discourage practical attempts to introduce "sweeter manners, purer laws." There is, no doubt, a fine flavour of scorn in the condemnation of the cumbrous machinery of both Houses of Parliament, Special Committees, specifications, and deposits of notices, the eloquence of the Parliamentary Counsel, and finally the Lord Chancellor in a cocked hat, and with all the solemn paraphernalia of the Royal Assent, permitting a Rural Council to buy two acres of land. This, as the writer of the articles declares, may be too wildly grotesque for belief. But there it is; and it is to be feared that any programme, rural or urban, which starts with a proposal to remove the anomalies of the British Constitution is foredoomed, if not to failure, at least to indefinite postponement. When, however, we come to less ambitious suggestions, we find ourselves entirely at one with our contemporary in holding that it is in the position and personality of its officials, rather than of its members, that a District Council can best be kept up to the mark. It is but too probable that no effectual reform will be feasible in respect of sanitation, nuisances, water supply, and so forth, unless a great change is made in the status, first, of Rural Medical Officers of Health, and, secondly, of Sanitary Inspectors. The conditions under which the medical officers carry out their statutory duties are undoubtedly as hostile to efficiency as they well can be; and even more detrimental are the conditions of appointment affecting inspectors.

And, now, what of the suggested remedy? (1) That no Medical Officer of Health shall engage in private practice, or be removable from office without the consent of the Local Government Board. (2) That Sanitary Inspectors should be required to possess some practical qualifications for the exercise of their duties, and be liable to dismissal only with the consent of the central authority. What is the current state of things? The Medical Officer of Health can give only the odds and ends of his much-occupied time to the discharge of the public functions for which he receives an insignificant salary. He must occasionally be torn with conflicting impulses—the consideration of his own interests on the one hand, and his duty to the public, especially the poorer public, on the other. While as to the Sanitary Inspector—who may be a broken-down farm bailiff or a local publican in humble intimacy with the farmers on the District Council—he probably knows nothing about sanitation, but, like other men, is fully alive to his own interests, and therefore earns with discretion the £50, £60, or £70 a year which is supposed to ensure his discharging his duties without fear, favour, or affection. "The more quietly he gets through the year, the better the property-owners of the district will like it. He is the tamest of tame cats among local officials." Here, then, without essaying "catastrophic change," is where a beginning should be made, and even that beginning will involve considerations eminently calculated to disturb rural ratepayers, the majority of whom are averse to "new-fangled notions." If you want exclusive medical services, you must pay for them; if sanitary inspectors are to be fit for their work, they must no longer be recruited from the ranks of the nondescript and the needy. This, of course, is a fiscal question. In truth, the whole problem is one of pounds, shillings, and pence; and, viewing it in this light, we cannot feel entirely confident that the new century will soon see the "Daily News" programme carried into effect by a statesman prepared to initiate remedial legislation "not to be written merely in the words of the statute-book, but in the happier homes and healthier lives of a great population."

The Society of Chemical Industry and the Metric System.—On Monday of last week, Dr. W. S. Squire delivered before the London Section of the Society of Chemical Industry an amusing dissertation on "Recent Objections Urged Against the Adoption of the Metric System." The correspondence in "The Times" last year on this subject was the incentive which urged Dr. Squire to put forward his plea in favour of the system. He waxed especially wroth with Sir Frederick Bramwell's championship of the English weights and measures, and poured irony on certain coincidences which that apologist had pointed out as evidences of the practical convenience of the English methods. Among these, the following will be very familiar to gas engineers: A gallon of water weighs 10 lbs., and a cubic foot of water contains 1000 ounces. We may add to these the following coincidences, which Dr. Squire did not name, and are without parallel in the metric system: The carbonization of a ton of gas coal yields approximately 10,000 cubic feet of gas, and the carbonization of a gallon of oil yields about 100 cubic feet of gas, having an illuminating duty, in round figures, of 1000 English candles. No doubt Dr. Squire's good-natured sarcasm would have been turned on any speaker who had made bold to mention these coincidences as a supplement to those named by Sir Frederick Bramwell. As a matter of fact, however, Dr. Squire met with very little relevant criticism in the discussion on his paper.

PERSONAL.

Mr. ALFRED LASS has resigned his position as one of the Auditors of the Crystal Palace District Gas Company.

Mr. F. TRETHEWY has been appointed Secretary of the Devonport Gas Company, in succession to the late Mr. Williams.

Mr. JAMES LORD, Deputy-Borough and Water Engineer, of Blackburn, has been appointed Borough Engineer of Halifax.

Mr. G. H. STEWART, of Ennis, has obtained an appointment under Mr. W. Nixon, Manager of the Southbank and Normanby Gas-Works.

The appointment of Engineer and Manager of the Buxton Gas-Works, in succession to Mr. G. B. Smedley, has been obtained by Mr. MATT. DUNN, of Goole.

Owing to advanced age, Mr. JOHN PICKUP has resigned the position of Secretary and Manager of the Westhoughton Gas Company, after 31 years' service.

The Directors of the Windsor Gas Company have elected Alderman JOHN LANHAM HOLLIS, J.P., Chairman of the Company in succession to the late Sir G. H. Long.

Mr. JOSEPH W. BUCKLEY, the Engineer and Manager of the Falmouth Gas-Works, has been installed W.M., for the current year, of the Lodge "Love and Honour," No. 75.

Mr. HARRY GRUNDY, the Borough Treasurer of Stockport, has been voted by the Borough Council £250 additional remuneration, in respect of the extra services rendered by him in connection with the purchase of the water-works.

Mr. HARRY PICKFORD has (out of 53 applicants) been selected to fill the position of Assistant-Manager of the Farnworth and Kearsley Gas Company. He has already been in the Company's service, in another capacity, for the past 16 years.

The resignation of Mr. G. D. Malam, the Gas Manager of the Bingley District Council, will shortly take effect. For the vacancy there were 29 applicants; and from these the Gas Committee made a selection of four. On Monday last week, the Committee finally resolved to appoint Mr. E. H. SWAINE, Assistant-Manager to the Oxford Gas Company.

At the annual social meeting of the employees at the Dawsholm and Temple Gas-Works of the Glasgow Corporation, noticed elsewhere, Mr. JOHN PHINN, late Secretary of the Works Friendly Society, was presented with a marble timepiece and side-ornaments, together with a silver tea service for Mrs. Phinn, in recognition of his valuable services to the Society.

NOTES.

The Pneumatic Pyrometer.

At a recent meeting of the Cleveland Institution of Engineers, Mr. Edward A. Uehling read a paper on the pneumatic pyrometer and automatic recording gauge. It was explained that the principle of this instrument is to utilize for thermometric purposes the law of the flow of air through two successive minute apertures. As now perfected, the instrument has been tested and calibrated at the Stevens Institute of Technology up to 2500° and even to 3000° Fahr., without injury or alteration of the zero point, which is in this case the boiling point of water. The pyrometer is credited not only with the accurate indication of high temperatures, but it also makes an automatic record of its indications. It thus supplies a convenient and reliable check upon furnace working, which is invaluable for showing what temperature conditions go to the production of known results, and whether the attendants do their work according to instructions. Practically, the pneumatic pyrometer is an aspirator, with an inlet and an outlet at different temperatures. The rate of flow of the air depends on the temperature; and although this is a simple physical law, it has taken much study and ingenuity to render it available in pyrometry. Mr. C. Lowthian Bell has criticized the pneumatic pyrometer to its general disadvantage, as compared with the electrical pyrometer, but admits that it is better as a recorder. It is further described as being valuable as a check upon boiler attendants. Possibly it would be serviceable in connection with water-gas producers.

Expanded Metal and Concrete Construction.

Attention is drawn by Mr. J. P. Allen, of Newcastle, in a paper reproduced in the "Builder," to the advantages of expanded metal as a new material of building and engineering construction. The manufacture of this material has been greatly improved since its first introduction; and it is now highly suitable for employment as reinforcement for concrete. It is a clean-cut, neat steel meshing, of many sizes, adaptable for all kinds of plasterers' and concreters' work. Mr. Mansergh is stated to have used great quantities of it in the new Birmingham Water-Works; and he has also specified it largely for the North Shields reservoirs. In making concrete floors, the expanded metal is buried in the concrete, as in the Monier system of construction; 3-inch meshes being the usual size for this application. The iron joists may be 42 inches apart, and the concrete 3 inches thick; the top being finished off with coke breeze concrete, which takes nails. The ceilings underneath these

floors are best made of an independent layer of the metal lathing, plastered. Partitions can be made with gauged plaster—a mixture of portland cement and plaster of Paris—on the extended metal. In short, the material offers to architects an exceptional aid to improvement in building, with the advantages of fire-proof, sound-proof, and vermin-proof construction. It is claimed that the addition of expanded metal to concrete increases the bearing strength of the slabs from about five to eight times. Unfortunately for the popularity of this system of construction for ordinary dwellings, it appears to run to about double the price of the common wooden flooring.

Steam Packings.

Some information on the friction of steam packings has been given by Mr. C. H. Benjamin to the American Society of Mechanical Engineers. It is remarked that ordinarily this is one of the most serious sources of loss of power; it being, indeed, possible to bring to a standstill a small engine or pump by injudicious treatment of the stuffing-boxes. There is no means of knowing, short of this, what amount of power is being wasted by the packings. Experiments designed to elucidate the matter were made, under Mr. Benjamin's direction, by the students of the Case School of Engineering. Many kinds of engine packings were used. It was ascertained generally that the softer india-rubber and graphite packings, which are self-adjusting and self-lubricating, consume less power than the harder varieties. The old-fashioned braided flax stuffing gave very good results. Oiling the rod will reduce the friction with any packing. There is almost no limit to the power that can be lost by an injudicious use of the wrench on the gland nuts. The power loss varies almost directly with the steam pressure in the harder varieties; while it is approximately constant with the softer kinds. The experiments were made on a 2-inch diameter piston-rod, and therefore correspond to all engines of between 50 and 100 horse power. Good practice appears to consist in the application on the glands of the very least pressure which will prevent leakage—first with the fingers only, and then very gently by means of the wrench. Some packings will run for awhile without oiling the rod; but many kinds require oiling from the first. The experiments amply bore out the importance of the subject to the power user, but unfortunately did not disclose any expedient by which bad handling could be detected. The softer and more economical made-up packings chiefly owed their quality to the presence of graphite and oil.

The Midland Association of Gas Managers will hold their annual meeting in Birmingham on Thursday, the 1st prox.

The Prepayment Meter Collections of the Gaslight and Coke Company.—During the past year, 75,258,000 pennies, weighing 647 tons, were dropped into the penny-in-the-slot gas-meters supplied by the above-named Company to 114,668 consumers.

The Export of Carbolic Acid.—We learn that, upon representations made to them by a deputation of manufacturers, the Government have removed the embargo upon the export of carbolic acid to the extent of giving the Customs authorities power to permit shipments of crude carbolic, upon receipt of satisfactory assurances from the exporters that such shipments will not be used to the disadvantage of this country.

The Will of Mr. Horatio Brothers, of The Elms, Putney Hill, who died on Dec. 19, 1899, was proved on the 26th ult. by Mrs. Marianne Brothers, the widow, and Francis William Brothers, the son, two of the Executors. The value of the personal estate is £104,470. The testator gives £200, his wines, &c., and the use of his household furniture, to his wife, £500 to his daughter Kate Alice, £100 to his niece Rose Wilson, £100 to the Consumption Hospital, Brompton, and £100 each to his trustees. The residue of his property he leaves, upon trust, during the life of his wife, to pay annuities of £700 to her, £400 to his son Francis William, £300 each to his daughters, and £150 to his son Arthur Horatio; and the remainder of the income thereof between his son Francis William and his daughters. On the decease of Mrs. Brothers, a sum of £4000 is to be held upon trust for his son Arthur Horatio.

British Association of Water-Works Engineers.—The winter meeting of the Association, which will be held next Saturday, at the rooms of the Geological Society, Burlington House, under the presidency of Mr. W. Watts, F.G.S., will be of special interest, as a question will be discussed thereat which is daily growing in importance. It may be remembered that, at the annual meeting last June, Mr. C. E. Jones, one of the Council, speaking in support of the resolution drafted by the Special Committee appointed to consider the subject of the control of watershed areas, expressed regret that there had not been constituted long ago a National Board for this specific purpose. We learn from the circular issued by Mr. Percy Griffith, the Secretary of the Association, that Mr. Jones purposes dealing at greater length with this question, in a paper entitled "The Nation's Water Supply and its Effective Control." He will recommend the centralization of the control of all sources of water supply, and define the powers and duties of the National Water Board which he suggests should be formed and entrusted with this duty. As the subject is of vital and national importance just now, and various technical and other societies will be invited to send delegates to the meeting to represent their views thereon, the Council desire to have a large attendance.

TECHNICAL RECORD.

THE WHITE DEPOSIT ON CEILING-PROTECTORS AND ON THE CHIMNEYS OF INCANDESCENT GAS-BURNERS.

The white deposit often found on the under-side of ceiling-protectors, and on the inner surface of chimneys of incandescent burners, has not hitherto been exhaustively investigated. Dr. C. Killing, however, has lately given, in the "Journal für Gasbeleuchtung," an account of some interesting researches which he has made on this and similar deposits. He was unable to find any references to earlier experiments bearing on the subject, with the exception of a report of an investigation by Priwoznik on the deposit which is found on laboratory water-baths. To this report he makes allusion in the sequel.

The material for analysis was scraped off the under-side of some small copper bell-shaped ceiling-protectors, hanging about 7 inches above the chimneys of incandescent burners. The highest yield from a single protector was about 8 grains; and as every protector which had been in use for a moderately long time was coated with the deposit, there was no difficulty in collecting ample material for analysis. The deposit usually was of a dirty white colour; but frequently it was pure white, or delicately tinged with blue. It could readily be scraped off the protectors, but not without some black scales of cupric oxide being removed along with it. The deposit was amorphous. When heated in a tube to incandescence, it first gave up water, and its bluish tint changed to gray, which as the heat increased gave place to brown, while white pungent vapours were evolved. Ultimately the mass became black. When mixed with soda, and submitted to a reducing blowpipe flame on charcoal, a red ductile bright bead of copper was obtained. The deposit was analyzed by boiling it, in the first place, in distilled water, and filtering off the insoluble matter, which was then treated with dilute hydrochloric acid. The black scales of cupric oxide were thereby dissolved; and the matter which still remained undissolved was fused with acid potassium sulphate, treated with water acidified with hydrochloric acid, evaporated, and the silica thus separated and filtered off. In the acid solution, iron was separated from the rare earths by precipitating the latter as oxalates. One portion of the aqueous extract was acidified; and the copper present was precipitated by means of sulphuretted hydrogen. After expulsion of the sulphuretted hydrogen from the filtrate, and addition of ammonium chloride, the rare earths were thrown down by means of ammonia, filtered off, and identified by means of oxalic acid. In the filtrate, lime and magnesia were precipitated by means of ammonium oxalate and phosphate respectively. In a second portion of the aqueous extract sulphuric acid was determined in the usual manner by precipitation with barium chloride. The water in the deposit was determined by heating to about 400° Fahr. The results of the analysis are appended:—

	Per Cent.
Portion insoluble in water—	
Silica	0·30
Ferric oxide	0·21
Rare earths	0·55
Cupric oxide (black scales)	8·90
Portion soluble in water—	
Rare earths	0·83
Sulphuric acid	30·76
Cupric oxide	28·70
Lime	0·76
Magnesia	0·28
Water	28·03
	99·32

The white deposit found on glass and porcelain ceiling-protectors, apart from very slight traces of ammonia, has always consisted wholly of sulphuric acid. Likewise the stains on the glass chimneys of incandescent burners, when washed off by means of hot water, were found to consist of free sulphuric acid. In some cases, the glass had been corroded, and thousands of very minute furrows on its surface prevented thorough cleaning by the hot water; but free sulphuric acid was always detected. No doubt traces of lime, magnesia, and silica were present, along with the free acid; but they were not discovered.

The analyses indicated that the deposit on the copper ceiling-protectors consisted chiefly of copper sulphate. Silica was derived from particles of dust from the atmosphere which had been incinerated in passing through the flame. Ferric oxide was partly derived from the same source, but partly also from the iron mantle-props. The scales of cupric oxide were rapidly formed on the metal under the influence of heat and the hot gases; and hence the presence of copper in both the soluble and insoluble portions of the deposit was readily accounted for. Lime and magnesia were partly derived from atmospheric dust, and partly from the upper part of the mantle, which consisted to a large extent of magnesia. The rare earths were, of course, derived from the mantles, which would gradually give up a portion of their friable substance under the influence of a strong upward current, and the jar received each time the burner was re-lighted. These effects would be more marked with imperfectly hardened mantles.

The view which is prevalent in England, and to a less extent in Germany, that cerium oxide is more readily volatilized than thorium oxide, if correct, would lead one to expect a preponder-

ance of cerium oxide in the portion of the deposit on ceiling-protectors which consists of the rare earths. But, on examining the rare earths collected from the deposit with hydrogen peroxide, which is a very delicate reagent for detecting cerium oxide, the colour produced was precisely similar to that obtained from the same quantity of the fresh material of the mantles. Also, when the rare earths recovered from the deposit were mixed with 100 times their weight of pure thorium oxide and made into a mantle, the mantle thus produced showed no marked difference in its photogenic properties from a mantle of pure thorium oxide, or from one consisting of thorium oxide and 0·01 per cent. of cerium oxide. If the rare earths recovered from the deposit had the same composition as the original mantle—viz., 99 per cent. of thorium oxide and 1 per cent. of cerium oxide—the mantle produced by mixing them with 100 times their weight of thorium oxide would contain 0·01 per cent. of cerium oxide, and would have the same composition as the last mantle referred to. Photometric tests showed that there was no difference in the photogenic powers of the three mantles; whereas if the rare earths recovered from the deposit had contained more cerium oxide than did the original mantle, the mantle in which they were embodied would have displayed a higher photogenic power than the others. The quantity of rare earths recovered from the deposit on ceiling-protectors was in all only $1\frac{1}{3}$ grains. Consequently, a mantle could not be formed wholly therefrom in order definitely to prove that they did not differ in composition from the original mantles. Nevertheless the evidence deduced almost certainly proved that the proportion of cerium oxide in the rare earths recovered from the deposit was not greater than in the mantles.

The deposit of which the analysis has been given above was obtained from Delstern, in Westphalia. The following is the analysis of deposit obtained from Düsseldorf :—

	Per Cent.
Portion insoluble in water—	
Silica	0·81
Ferric oxide	0·61
Rare earths	trace
Cupric oxide (scales)	2·16
Portion soluble in water—	
Rare earths	Nil
Sulphuric acid	30·48
Cupric oxide	31·45
Ferric oxide	0·58
Lime	0·70
Magnesia	0·15
Water	32·02
	98·96

The rare earths could not be detected in the portion soluble in water, and only in scarcely recognizable traces in the insoluble portion of the deposit. The Düsseldorf deposit must therefore be regarded as almost free from the rare earths. In face of these analyses—especially that of the Düsseldorf deposit—can volatilization of the rare earths be deemed to occur, or a greater predilection to volatilization be ascribed to the cerium oxide than to the thorium oxide ?

The sulphuric acid found calls for further comment. The commercial preparations of thorium, in use in mantle manufacture, contained until quite recently considerable quantities of sulphuric acid. In 1896 and 1897, the lowest proportion found by Dr. Killing was 1·1 per cent., and the highest 3·9 per cent. Even at the present time, the majority, though not all of the thorium preparations contain sulphuric acid. On the other hand, cerium nitrate never was found to contain sulphuric acid. Hence many technical men have been inclined to regard the sulphuric acid of the thorium preparations as the cause of the deposit on ceiling-protectors. But on the bells and chimneys there might often be found more sulphuric acid than any mantle would afford. Taking the highest amount of sulphuric acid found in a mantle—viz., 3·9 per cent.—one mantle would yield at the most 0·6 grain of sulphuric acid, even assuming that no loss took place in the processes of incinerating and hardening the mantles. In one case, however, 2·3 grains of sulphuric acid were present in the deposit recovered from a copper ceiling-protector placed over a burner on which two mantles only had been used. The sulphuric acid thus found could not, therefore, have arisen wholly from the mantles.

In order to determine more precisely whether the acid in the thorium nitrate played any part in the formation of the deposit on ceiling-protectors, mantles were made from thorium nitrate containing 3·9 per cent. of sulphuric acid. In a burnt-off, but unhardened mantle, the acid could still be detected. In a second mantle, which had been burnt off and raised to incandescence for a quarter of a minute by means of high-pressure gas, only traces of the acid could be found. A third mantle from the same thorium nitrate, after being raised to incandescence for two minutes, just as it would be in the ordinary course, contained no trace of sulphuric acid. Consequently sulphuric acid cannot be present in mantles made from the commercial thorium nitrate, which now contains very little sulphuric acid compared with the thorium nitrate from which these experimental mantles were made. It may therefore be regarded as certain that the white deposit has not been formed from sulphuric acid derived from the thorium nitrate used in the production of mantles.

The following table shows the quantities of sulphuric acid which were found on a copper ceiling-protector, in the form of copper sulphate, after 100 hours' consumption of gas, under a pressure of 16·10ths, calculated for a uniform rate of consumption of 3·5 cubic feet per hour :—

—	Batswing Burner.	Argand Burner.	Incandescent Burner.		
			Without Mantle.	With Mantle of Pure Thorium Oxide.	With Ordinary Mantle.
Grains of sulphuric acid	0·073	0·358	0·401	0·433	0·451

These figures indicated that with all burners in which the products of combustion were directed by a chimney straight up to the copper bell-protector, practically the same amount of sulphuric acid was collected on the bell. The absolute quantities were not identical, because the rates of consumption actually used varied—being for the batswing 7·75, for the argand 5·65, and for the incandescent burner 3·5 cubic feet per hour.

When a porcelain ceiling-protector was used, in place of a metal one, the sulphuric acid collected thereon only amounted to about 0·05 grain after 100 hours' burning, with either a pure thorium oxide mantle, or an ordinary one. The non-conducting porcelain bell was so hot that little sulphuric acid condensed on it; whereas the copper bell remained comparatively cool owing to the rapid conduction of heat from it. The copper also, for another reason, might collect more sulphuric acid than the porcelain bell. The layer of cupric oxide which rapidly formed as the copper became heated, would, like platinum, be capable of oxidizing vapours of sulphurous acid to sulphuric acid, and then would retain the latter in the form of cupric sulphate. The small quantities of sulphuric acid found on the porcelain bell (with which the effects of this action of cupric oxide were absent) did not enable any conclusion to be drawn as to whether the cerium oxide in the ordinary mantle played any part in oxidizing sulphur or sulphurous acid to sulphuric acid.

The facts established by the researches may be summarized thus: Sulphuric acid in the thorium nitrate used in the manufacture of the mantles is not responsible for the deposit on ceiling-protectors and chimneys, which must arise from the small amount of sulphur present in the gas consumed. The gas used in the researches contained no sulphuretted hydrogen; and the total sulphur, on the average, did not exceed $3\frac{1}{4}$ grains per 100 cubic feet. Even in the case in which the largest quantity of sulphuric acid was collected on a copper bell, the amount was equivalent to only 0·05 grain of sulphur per 100 cubic feet of gas consumed. Therefore only 1·5 per cent. of the total sulphur in the gas was ever recovered in the deposit formed on the ceiling-protector.

Priwoznik, in his investigation already referred to, concluded that neither luminous nor non-luminous coal-gas flames developed free sulphuric acid. This conclusion cannot be regarded as prejudiced by the fact that small quantities of free sulphuric acid were found, in the course of the researches now described, on porcelain ceiling-protectors and glass chimneys. Any contact of the gases formed on combustion, or of the flame, with copper or brass, would result in the production of sulphuric acid, as soon as a layer of cupric oxide had formed on the metal. Dr. Killing wishes to reserve to himself further investigation of this question, by examination of the gases produced on combustion when the apparatus is quite free from metals. He anticipates that he will be able to prove that the cerium oxide of the mantle extends its intense oxidizing action even to the sulphur of illuminating gas, and produces sulphuric acid therefrom.

THE VALUE OF PRODUCER GAS AS A FUEL.

The following article, sent to the "Iron and Coal Trades Review" by a special contributor, appeared in the number of that publication for the 2nd inst.

The question, What theoretical loss of heating power does coal suffer when burned indirectly as "producer" gas? is one which has already been dealt with by some authorities; but the inquiry is not exhausted. The idea current in the minds of many who give some thought to the subject is that indirect burning of this kind causes a loss of something like one-third of the heating-power of the coal. Such an idea is likely to have arisen in this way: Carbon burnt to carbonic oxide—the most important component of producer gas—parts in the burning with 30 per cent. of its full heating power; and as carbon is the chief constituent of coal, the loss in the case of the one body has evidently been placed over against the other. Coal, however, is far from being all carbon. Moreover, the carbon of coal is of two kinds—volatile and fixed. Each kind behaves in its own way inside the producer. The carbon that is fixed is the only carbon to suffer loss of heating power by the burning inside the producer. The volatile carbon suffers no loss of heating power. It becomes rather the absorbent of much of the heating power the other carbon loses.

To make this plain, it is necessary to bear in mind certain facts relating to coal and its combustion. The burning of coal is both a heat-giving and a heat-absorbing operation; and this

is so, no matter how the coal is burned, whether a producer be used or not. Before the first appearance of flame can kindle on a piece of ordinary coal, heat must have been absorbed and work done upon that piece. This work is the liberation of gas and vapour out of its solid mass. The change in volume which takes place on the gas and vapour substance so liberated is very great. A single cubic foot of coal may yield several hundreds of cubic feet of gas and vapour, and this, too, while the coal to outward appearance is suffering no diminution of its own bulk. Such a change in volume in any body has a close connection as to amount with the amount of the heat which must disappear in working the change. Thus a cubic inch of boiling water in becoming a cubic foot of steam works up, or causes to disappear, heat sufficient to make boiling hot other 6 cubic inches of cold water. Of the whole substance of the coal, there is usually about one-third (in many cases a good deal more) over which there passes this great change in volume. From this, it will be seen that heat absorption on a scale too great to be overlooked has to be reckoned with in the combustion of a lump of coal.

Of the particular form of combustion which takes place inside the producer, it is necessary also to say something. The only combustion there which need take place is that of the fixed carbon of the coal burning to carbonic oxide. The carbon by this burning becomes dissolved away from its solid form into a fluid combustible gas until only its incombustible ashes remain. This burning produces a definite quantity of heat, and out of the sum of that heat is supplied whatever part may be necessary to drive out all the vapour and gas referred to above. But this sum of heat has to be drawn upon to supply heat for work of another kind as well. The air which burns the carbon to carbonic oxide is, of course, ordinary atmospheric air. Atmospheric air carries with it a small proportion of water vapour, variable in amount, but never entirely absent. This water vapour becomes decomposed in its passage through the red-hot carbon in the lower part of the producer, and there results from this decomposition another enlargement in volume compensated for by a further absorption of heat. The supply of this heat is another drain upon the heat which results from the burning of the fixed carbon to carbonic oxide, but a drain which means in this case no permanent loss.

Heat, then, being absorbed to a considerable extent in any burning of coal, and that amount of heat which is generated within the producer being only the fraction of a fraction, it would appear to be possible to have a balance established between the heat produced and the heat absorbed inside the producer.

This matter, so important, is one which fortunately can be brought to the test of figures—approximately so tested, at least. Before the figures are brought in, it may be explained that one of the chief factors of the calculation to be entered upon—the proportion of heat absorbed in driving out a given weight of gas and vapour from coal—has not as yet had an exact value assigned to it. The value which will be given to it here is the same as that attributed to it by Sir Lowthian Bell in his work on the "Principles of the Manufacture of Iron and Steel." In that work, calculations have been made of heat absorption of this kind in coke making, and also in iron smelting where raw coal is the fuel. A second doubtful factor of the calculation is the amount of heat produced by the burning of mixed hydrocarbons. A value not likely to be far wrong has been taken for this—a value based upon the findings of the chief authorities. But any error on this head can have very little effect upon the conclusions drawn.

Returning, then, to the main question of the effect on heating power in using the gas-producer, it would appear that the nature of the coal must have consideration. Lanarkshire splint coal might be taken in the first place as possibly a fair representation of the common or manufacturing coals of Scotland. The composition of this coal is given in Bell's work referred to above as the following:—

	Per Cent.		
Water given off at 212° Fahr.	11·62		
Carbon	66·00	—fixed	53·41 and volatile 12·59
Hydrogen	4·34	total	16·37
Oxygen	11·09		
Nitrogen	0·94		
Sulphur	0·59		
Ash	5·42		
	100·00	Total gaseous constituents	28·96

This coal, if burned in an open fire-grate in the usual direct fashion, would give something like the following value in heating power:—

	Heat-Units.
Carbon (fixed), 53·41 × 8000	= 427,280
Hydrocarbons (carbon, 12·59; available hydrogen, 2·95), 15·55 × 12,000	= 186,600
Together	613,880

But this heat is not all available. Deduction, as explained, has to be made therefrom for—

	Heat-Units.
Evaporation of water in coal, 11·62 × 622 (537 + 85)	= 7,227
Expelling gaseous matters in coal, 28·95 × 2000 (Bell)	= 57,920
Together	65,147

The net heating power works out therefore to 613,880 − 65,147 = 548,733 heat-units.

Comparing this result with the heating power of the producer gas from the same coal, the gas being burnt cold, the figures are:—

	Heat-Units.
Carbon, 53·41 = carbonic oxide, 124·62 × 2400	= 299,088
Hydrocarbons (same as above), 15·55 × 12,000	= 186,600
Hydrogen derived from moisture of blast, 0·288 × 28,600	= 8,236
Total heating power of gas	493,924

The difference between these two sums, 548,733 and 493,924 is 54,809, which means that 9·98 per cent. of the heating power of the coal would be lost by burning it as producer gas.

Coal might be taken next, where the composition is more than of the average of the coals of the whole United Kingdom. To such coal it might not be far wrong to give a composition of fixed carbon, 60 per cent.; volatile matters, 30 per cent., whereof 20 per cent. are combustible; and moisture and ash, 10 per cent. (moisture 5 and ash 5).

This coal, burned directly in the ordinary fire-grate, would give probably the following value in heating power:—

Carbon (fixed)	60 × 8,000 = 480,000	heat-units.
Hydrocarbons	20 × 12,000 = 240,000	,,
Together	720,000	heat-units.

Deduct now—

Evaporation of moisture	5 × 622 = 3,110	heat-units.
Expelling volatile matters	30 × 2,000 = 60,000	,,
Together	63,110	heat-units.
Net heating power	720,000 − 63,110 = 656,890	heat-units.

Converted into producer gas, and this gas burnt when cold, the result in heating power from this same coal would be—

Carbon 60 = carbonic oxide	140 × 2,400 = 336,000	heat-units.
Hydrocarbons	20 × 12,000 = 240,000	,,
Hydrogen derived from moisture of blast	0·324 × 28,600 = 9,266	,,
Total available heating power of gas	585,266	
656,890 − 585,266	= 71,624	heat-units of loss

The loss per cent. of heating power in burning this coal as producer gas would be 10·9.

As the fixed carbon of a coal increases, it will be seen this calculation makes the proportion of loss by indirect burning to increase likewise. Again, with a coal containing very low fixed carbon—say, down to about 40 per cent., and volatile matters coming up to about 50 per cent.—the calculation would show no loss whatever for conversion to producer gas. Not many ordinary coals are found in this country where the ratio of fixed carbon to volatile matters is so low as 4:5; but even a much lower proportion of fixed carbon to volatile matters than this is found among the carbonaceous shales of the coal measures.

If anthracite coal be taken as representing the very highest ratio of fixed carbon to volatile matters in the whole of the coal family, the carbonaceous shales might be taken as the representatives of the other end of the scale. Anthracite may have nine or ten parts of fixed carbon for a single part of volatile matter; the shales a single part of fixed carbon to five or six parts of volatile matter. Anthracite as a fuel for making producer gas, when tried by the calculations used above, might show a loss in heating power as high as 25 per cent., or even fully more. The shales tried in the same way could not show any loss. Mixed with ordinary coal in a producer, the shales might even become the useful absorbents of surplus heat taken by the producer out of the coal, and thus make the gas-making process theoretically perfect so far as the heat equation is concerned.

The conclusion this points to is favourable to the use of the gas-producer. Previous calculations do not appear to have taken account of the heat-absorption side of the question. It is difficult, however, to see how this can be disregarded in reasoning upon either the theory or the practice of the matter. Carbonic acid in the shape of gas, and water in the shape of vapour, become discharged as the ultimate products of burnt-out fuel in all the forms of burning; and the latent heat of a vastly increased bulk must with these be carried off with no chance of recovery.

The correction in these calculations which has to do with moisture in the air that burns the carbon to carbonic oxide is based upon the average amount of such moisture in the air of this country. No allowance is made here for steam additions such as are common in the generation of producer gas. Steam, no doubt, can be used with advantage to store up the surplus heat of the producer, just as the natural moisture of the air is seen to store it up; but to generate steam requires heat. Besides, there seems likely to be a difficulty in using it exactly in the quantity required if carbonic acid is to be kept down in the gas.

The heat which hydrogen is assumed to absorb for its decomposition, and afterwards to give out again in burning, is not the full heat value of hydrogen burnt to water. The latent heat of the vapour is deducted. This latent heat comes with the air, and departs again with the products of combustion.

It has been proposed, for the sake of certain advantages, to melt out as a liquid slag the incombustible ashes of the fuels used in producer, gas making. This operation would absorb heat not absorbed in ordinary burning. Any solid body in becoming a liquid body absorbs heat for the work spent in making the change. The amount of this heat appears to be

affected very much by the nature of the body itself. The cinders or slags of iron-smelting blast-furnaces appear to be the only substances of a similar nature which have had their latent heat of fusion determined. Authorities differ in the value they give for the fusion of these. The value taken by Sir Lowthian Bell is 550 units. Assuming this to be correct, as applied to the earthy matters of coal, then for each 5 per cent. of these matters in the coal the absorption for latent heat of fusion would be 2·750 units, or less than one-half per cent. of the full heating power of the coal. Heat for this work would be drawn, as in the other cases, from the producer combustion—that is, from the carbon there burning to carbonic oxide; and the work would be done with no lessening whatever of the heat potential in the producer gas.

The sum of all the foregoing would seem to be—

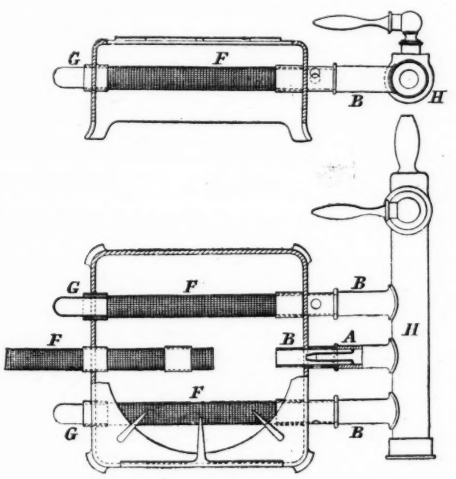
1.—That in making producer gas with coal of average quality, the loss in heating power need not be much over 10 per cent.

2.—That this 10 per cent. of loss might be wiped out by certain changes in the fuel.

REGISTER OF PATENTS.

Gas Heating-Burners.—Mills, B. J. B.; a communication from La Société Anonyme des Fontaines à Gaz, of Fontaines-sur-Saône, France. No. 3552; Feb. 17, 1899.

This heating apparatus consuming low-pressure gases is characterized by the supply of air being obtained by means of the combustion of the gas burning on the surface of one or several wire-gauze tubes, of suitable form, arranged horizontally or vertically—the supply of air being obtained partly through this wire gauze and partly through exterior openings arranged around the jets supplying the gas to the burners.



As shown, a part of the arrangement adopted in an ordinary bunsen burner is utilized—namely, the flow of the gas through a conical ajutage A into a larger tube B, formed with openings, which can, by means of a moveable sleeve, be more or less closed. Besides the diameter of A being greater than in gas-heating apparatus burning gas at ordinary high pressure, the flow of air through the openings is no longer due to the pressure of the gas (as this latter is almost of no account), but is rather due to the combustion of the gas itself by special burners.

These burners are attached to a main conduit H, serving to receive the gas from the main. They are formed of tubes F of wire gauze, having very fine openings or meshes, arranged parallel with each other, and are fixed by one of their ends around the tubes B, and closed at their other ends by a hollow stopper G.

In these conditions, the gas burns above the wire-gauze tubes, and its combustion draws in a supply of air partly through the holes of the wire gauze, and partly through the openings in B.

Treating Coal and other Illuminating Gases.—Colman, H. G., of Birmingham. No. 4742; March 4, 1899.

In view of the interest attaching to the subject dealt with by the patentee in his paper presented to the last meeting of the Nottingham Section of the Society of Chemical Industry—see "JOURNAL" last week, p. 330—we give practically speaking in its entirety the specification (not illustrated) of the above invention, which was issued on Saturday.

The invention relates to the treatment of coal or other illuminating gas at the stage of manufacture known as condensing; and its object is to obtain increased illuminating power and a more complete removal of the naphthalene.

The first part of the invention consists in removing the finely divided tarry matters suspended in the gas before permitting it to enter the condensers proper, and while it is still warm—say at about 100° to 140° Fahr. This is preferably accomplished by means of a centrifugal separator. The second part of the invention consists in diverting a portion of the gas before it is completely cooled, and causing it to rejoin the gas in the condensers when the main part has been wholly or completely cooled. The hydrocarbons carried by the uncooled gas are thus added to the main body at a time when they can be retained, and aid the illuminating power. A bye-pass may be used for this part of the invention. The third part of the invention consists in passing the gas before entering the condensers through a washer containing warm hydrocarbons, which removes the naphthalene, while adding to the gas a considerable quantity of vapour of low boiling liquid hydrocarbons.

The treatment may be divided into three parts, each of which may be applied separately, or any two of them together, or finally all three in succession.

The object to be attained in the first part of the invention is the removal from the hot gas, previous to its entering the condensers, of the whole of the liquid matters which have then separated, including not only the stream of tar flowing with the gas, but also the finely divided tarry particles mechanically suspended in the gas. These particles in the ordinary method of condensation pass with the gas into the condensers; and in the subsequent cooling they attract considerable quantities of the low boiling substances present as vapour in the gas, which are thus run away to the tar-well instead of being retained in the gas. By the present proposal for the removal of the particles from the gas at temperatures at which their attraction for the low boiling substances is small, the patentee claims to be enabled to retain a larger proportion of the latter (chiefly benzene and toluene) in the thoroughly cooled gas than would otherwise be the case—thus increasing its illuminating power. Further, owing to the removal of these high boiling constituents of the tar before the condensers are reached, the hydrocarbons which separate in the latter consist mainly of light oils, with very little of the higher boiling compounds; and such light oils, being then capable of dissolving a greater amount of naphthalene than is the case with the tar separating out under the ordinary method of condensation, effect a more complete removal of the latter hydrocarbon from the gas.

The apparatus employed for the removal from the gas of suspended tarry particles is of the ordinary centrifugal separator type. An appliance similar to the well-known cyclone dust collector is found quite suitable; an ordinary flap or other valve being provided thereon, by means of which the linear velocity of the gas entering the cyclone can be regulated to a constant quantity with varying volumes of the gas passing through the apparatus. A vertically adjustable outlet pipe is also arranged, to allow of a variation in the height at which the gas leaves the separator; and a syphon to discharge the tar from the bottom of the separator.

The second part of the invention consists (as hereafter described) in the bye-passing of a portion of the gas from the inlet of the condensers, and re-introducing it therein at one or more subsequent points, after the main stream of gas has undergone partial or complete cooling; and it may be used alone or in conjunction with the prior separation process already described. The secondary stream of gas which will, under usual conditions, have a temperature varying from 100° to 140° Fahr., will always be saturated with the hydrocarbon vapours at that temperature; and on mixing it with the wholly or partially cooled gas, it is suddenly reduced in temperature, with the result that a considerable quantity of the hydrocarbons is deposited in the form of mist or fog, which exposes an immense surface to the gas. An interchange then quickly occurs between the particles of the light oils and the gas; the latter taking up a portion of the lowest boiling constituents of the light oils, while the still liquid portions of the particles, which consist of hydrocarbons having a very great dissolving power for naphthalene, absorb the latter hydrocarbon from the gas and carry it finally to the tar well.

In carrying out the process, streams of hot gas previously diverted (by means of any suitably arranged bye-pass and connections) from the main bulk or stream of the gas, may be returned to the condenser and mixed with the main bulk when at different temperatures; but in all cases 10 to 20 per cent. of the hot gas must be added to the main stream when the latter has been reduced to a temperature of at least 70° Fahr., by which time the greater quantity of tarry matters will have been removed, even if no preliminary removal of these has been made—as indicated in the first part of the invention. The gas is then always capable of taking up considerably larger quantities of benzene and toluene, which are supplied to it by the secondary stream of gas. If the tarry particles separator is not used before the condensers, it may be used with advantage for the secondary stream of gas.

The result obtained by this part of the invention is therefore the same as in the previous case—the low boiling constituents of the hot gas are more completely retained in the gas, while the naphthalene is more completely removed.

The process comprising the third part of the invention is as follows: Before entering the condenser, the gas is passed through a suitable washer (preferably of the Livesey type), in which it is divided into a large number of fine streams, which bubble through a seal of the liquid hydrocarbons separated out in the condenser—these latter being heated, previous to running into the washer, by passing through a coil of pipe in the main conveying the hot gas; the washer itself being maintained, by any suitable means, at a temperature equal to that of the hot gas. If the tarry particles have not been previously removed by the cyclone separator in accordance with the first part of the invention, the washer will effect their removal; but the previous use of the separator will greatly minimize the chance of a block in the washer. Further, the contents of the washer then remain nearly free from high boiling tar constituents; rendering them more effective for the purpose in view. The tarry particles being thus removed, the hydrocarbons which separate out in the subsequent condensation will consist of such as have an appreciable vapour tension at 120° to 140° Fahr.—*i.e.*, chiefly the light oils; and the hot gas, therefore, passes in fine streams through these hot light oils, which dissolve out the naphthalene, while at the same time the gas picks up a certain proportion of the lower boiling constituents of the light oils, especially benzene and toluene, which pass on into the condenser. In this manner, there is always present in the condenser a larger proportion of low boiling hydrocarbon vapours than is in the gas produced by destructive distillation; this extra proportion continuously circulating through the condenser, and separating out in the cold portion, returning them to the washer where it is again taken up by the hot gas. By this means, the partial pressure of these vapours during condensation is greater than would otherwise be the case—thus causing a larger quantity to be retained in the gas, and increasing the illuminating power. Also the presence of an additional quantity of the light oils in the condensers assists in the removal of any naphthalene which may have escaped the action of the hot light oils in the washer at the inlet to the condensers.

In place of supplying the washer with the hydrocarbons separating

out in the condensers, it may be fed with the light oils obtained by the distillation of coal or oil tar. Where the condenser tar is used, this must only be allowed to remain in the washer sufficiently long to allow of the lowest boiling portions being taken up by the hot gas; if allowed to remain too long, the latter takes up appreciable quantities of naphthalene, instead of losing it.

The claims made for the invention are: 1. In the manufacture of coal and other illuminating gas, the removal from the gas, before it enters the condensers proper, of the stream of tar and of the finely divided tarry matters suspended therein, as described. 2. The diversion of a portion of the gas from the inlet of the condensers, and subsequently causing such portion to rejoin in the condensers the part from which it was separated. 3. The passing of the gas, before it enters the condensers, through a washer wherein it is divided into fine streams, and caused to bubble through a seal of heated liquid hydrocarbons. 4. The treatment of the gas by a combination of any one of the three processes named in the preceding claims with either or both of the others.

Obtaining Cyanogen Compounds.—Mactear, J., of Victoria Street, S.W. No. 5037; March 7, 1899.

The patentee's object is to obtain ammonium cyanide by submitting a mixture of gaseous ammonia and gaseous carbonic oxide, in a decomposing chamber—preferably charged with a suitable catalytic substance—heated internally (by employing an electrical resistance), to a temperature sufficient to decompose the gaseous mixture, and to cause the formation of the ammonium cyanide; also to obtain the ammonium cyanide in such manner as a step in the production of other alkaline cyanides and cyanogen compounds.

In carrying out the invention, the gaseous ammonia and the gaseous carbonic oxide are first mixed, in the respective proportions of about two volumes of the former and one volume of the latter, in a closed chamber, to which they are supplied by rotary pumps or blowers of such sizes, and driven at such speeds, as will deliver the gases in the required proportions. The gaseous mixture is then led into the decomposing chamber, wherein the mixture is heated to a temperature (approximately 1800° to 2000° Fahr.), sufficient to decompose it, and to cause, as the products of the reaction, the formation of ammonium cyanide and water.

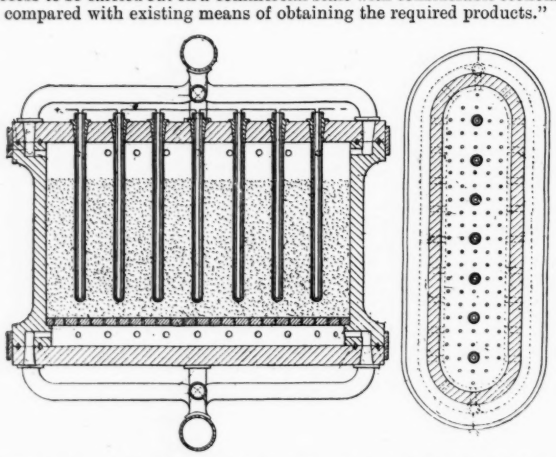
These products are led from the chamber and cooled, and, if (say) alkaline cyanides are required, are directed into suitable absorption vessels containing appropriate alkaline hydrates in solution in water or alcohol—such, for example, as caustic soda when sodium cyanide is required, or caustic potash when potassium cyanide is required, or a mixture of caustic soda and caustic potash when a mixture of sodium and potassium cyanides is required—with the consequent formation of the required cyanide or cyanide mixture, and liberation from the ammonium cyanide of the ammonia, which latter may be recovered and again used in the cycle of operations.

The solution of the alkaline cyanide or mixture of cyanides obtained is evaporated, preferably *in vacuo*, and the resultant cyanide or mixture of cyanides prepared for sale as a crystalline mass or else fused.

If ferrocyanides or other cyanogen compounds are required, the cooled products from the decomposing chamber are in like manner submitted to the action of known means of obtaining such compounds from ammonium cyanide.

To keep the volume of the gases entering into the reaction in the production of the ammonium cyanide as small as possible, the gaseous carbonic oxide should be used as pure as obtainable; and to this end, the patentee prefers that it should be procured by decomposing carbonic acid in sufficiently heated closed vessels charged with coke or carbon, and by freeing the resultant carbonic oxide from any carbonic acid in suitable purifying vessels. If, however, for any reason, the volume of the gases to be dealt with is not of material importance, a mixture of gaseous carbonic oxide with nitrogen or with nitrogen and hydrogen (such as may be obtained by the limited combustion of carbonaceous matter with air or with air and steam—as "producer gas" or "Dowson gas") may be used, in lieu of the gaseous carbonic oxide, in mixture with gaseous ammonia.

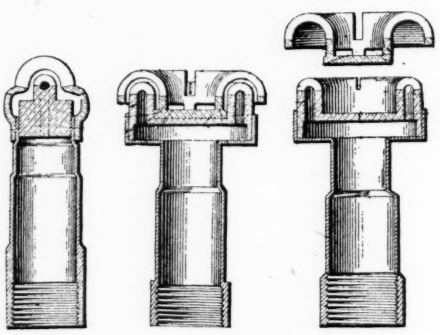
The heating of the decomposing chamber internally by the employment of an electric resistance is said to be of special utility and advantage, in enabling a practically equal temperature throughout the chamber to be obtained, "which is so essential a requirement to the economical obtainment of the required products," and also in enabling the chamber to be made of such a size, and of such internal dimensions, as will "enable the process to be carried out on a commercial scale with considerable economy as compared with existing means of obtaining the required products."



The accompanying drawings represent one form of the electrical furnace employed in carrying out the invention. It is a vertically arranged chamber, made of porcelain or other refractory material, and formed of an oblong shape with open ends and flanged extensions, the end faces of which are each formed with a surrounding annular channel, communicating with the interior of the chamber by lateral perforations. The chamber-ends are closed by covers, each of which is formed with through openings, adapted to communicate with the adjacent channels of the chamber. The openings at the inlet-end of the chamber communicate by branched piping with a main leading from the mixing chamber of the gases to be decomposed; and the openings at the outlet end of the chamber communicate by branched piping with a main, by which the products of the reaction of the gases in the chamber are led to the absorption vessels, wherein the ammonium cyanide is converted into the alkaline cyanide or other cyanogen compound required. The chamber is heated internally by a series of electrical resistances in the form of coils of platinum wire wound upon a support of refractory material mounted in a tube of refractory material passing into, or through, the chamber; the resistances being connected with a dynamo by means of which their temperature can be raised to such a point as will give the required equal temperature in the spaces between the adjacent tubes, and also in those between each of them and the adjacent sides of the chamber, whereby the desired equable temperature of the whole interior of the decomposing chamber is effectually obtained.

Acetylene Burners.—Dolan, E. J., of Philadelphia, U.S.A. No. 6116; March 21, 1899.

This invention has for its objects (among others) the provision of a burner by the use of which a flat-flame is produced from acetylene having "great illuminating power, the flame being absolutely smokeless." Another object is to provide for the mixing of the gas with a suitable quantity of air, to ensure perfect combustion, and also to cool the lower gas-tip, and prevent combustion taking place thereon. A tip is employed, having a slot preferably of the peculiar construction shown in the

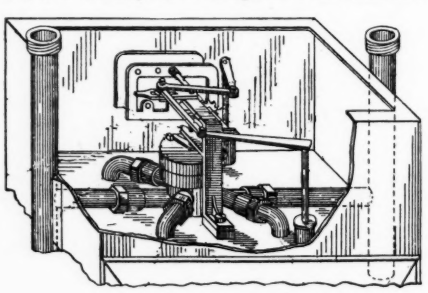


engraving as to its dimensions; and above this is fitted a cap having a combustion slot of greater area than the lower tip, with provision for the introduction of air at a point intermediate of the two slots. The invention is as applicable to a burner with a plurality of slots as it is to a burner having a single slot.

The illustration gives two forms of such a burner—in the second case with the cap shown also in its raised position for purposes of cleaning.

Detachable Valve for Gas-Meters.—Seymour, J., and Clark, W. J., of Toronto, Canada. No. 16,141; Aug. 8, 1899.

The object of this invention is "to simplify the mechanism for controlling the passage of gas in the meter, and to make it readily removable for repairs." It consists essentially of a valve-seat having detachable connections with the gas-spaces of the meter, the inlet-pipe, and the outlet-pipe; and of a rotary valve—the parts of the valve-seat and valve

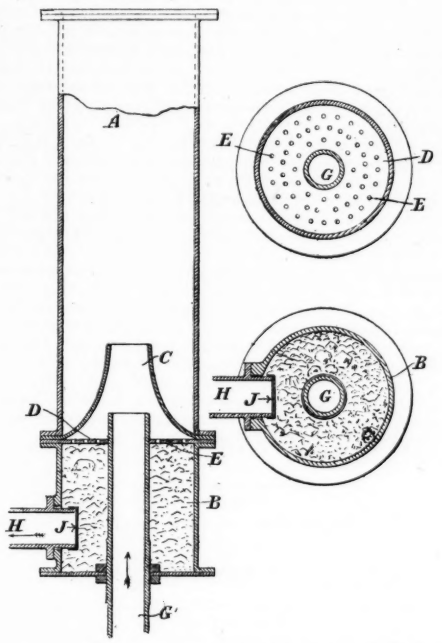


being provided with ports, and so shaped that those to the gas-spaces of the meter are successively placed alternately in connection with the inlet and outlet pipes of the meter by the rotation of the valve. The standard supporting the mechanism for rotating the valve is detachably secured to the meter, as shown in the engraving, which is a perspective view, and will sufficiently indicate the scope of the invention without further description.

Silencers for Gas-Engine Exhaust.—Evans, A. F., of Cambridge. No. 24,349; Dec. 7, 1899.

This invention relates to apparatus for reducing the effects of the intermittent escape of exhaust gases after explosion in a gas-engine cylinder, by providing two vessels or chambers, preferably cylindrical in form, and both having the same diameter—the upper chamber being about four times the length of the other chamber. The outer end of each chamber is closed by a flanged cover-plate; and between the two chambers is a perforated plate, over which is fixed a funnel tapering towards the larger chamber. A smaller pipe leads through the middle of the smaller cylindrical chamber and the perforated plate into the funnel; and it is connected with the exhaust-pipe of the engine. Another similar pipe leads out of the side of the smaller cylindrical chamber for conveying away the spent gas.

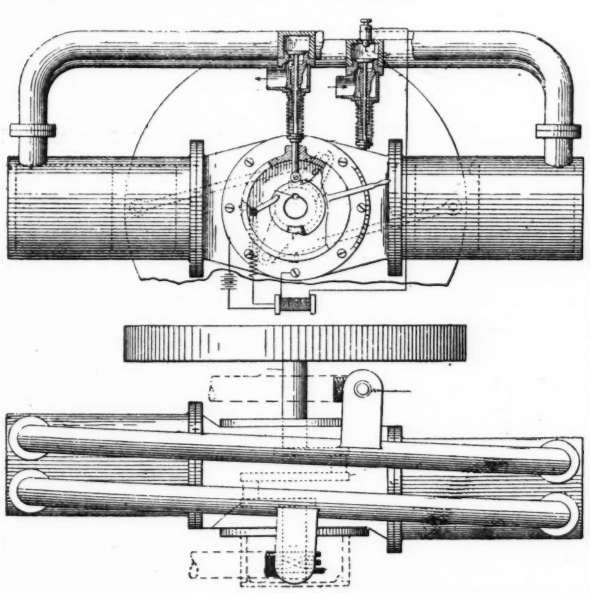
In the engraving is represented an elevation (partly in section) of the apparatus, a plan of the perforated plate, and a sectional plan of the smaller chamber and outlet-pipe.



A is the larger (the "buffer") chamber; B, the smaller or outlet-chamber; C, the injector-funnel; D, the perforated division-plate, with perforations E; G, the discharge-pipe leading from the engine cylinder to the cone of the funnel; and H, the outlet-pipe, which, if preferred, may be provided with a grating J. The chamber B can be filled with coke or other material, in order to scour or deodorize the issuing products from the engine. On a spent charge issuing from the cylinder, it enters the chamber A, and increases the pressure therein, but is prevented from escaping until the incoming gases have diminished in velocity sufficient for the gases in it to overcome the injection action of the funnel C, when they will eventually escape to the atmosphere through the chamber B and pipe H.

Explosion-Engines.—Smith, H., of Springfield, Mass., U.S.A. No. 18,425; Sept. 12, 1899.

This type of gas or explosive engine embodies a pair of cylinders oppositely arranged, but axially approximately coincident or parallel; each having a piston operating on a common crank-shaft. The outer ends of both cylinders are connected by a common comparatively large bow-shaped conduit, which constitutes a continuation of the explosion chambers of both cylinders, and permits simultaneously the action of the exploded gas oppositely inwardly on both pistons.



In such an engine as heretofore proposed, a common valve-chest or chamber has been provided in communication with the common conduit extensions formed as continuations of the explosion chambers for both the cylinders, in which valve-chest both an inlet-valve for supplying gas to the engine for both cylinders, and a valve for the exhaust from both of the cylinders through the common extension conduit, were provided. In such an engine, after the gas which entered the common conduit extension and simultaneously into both the cylinders has been exploded, the next stroke of the piston following the explosion or working stroke forced the dead-gas endwise outwardly in the opposite cylinders, and through the common conduit and cylinder extensions towards (and partially out through) the discharge-port—the discharge or exhaust valve at such period being open. But at best, a certain portion of the exhaust or dead-gas would remain in the chest or chamber in which both the inlet and exhaust valves are provided, and also in the common conduit extension—impairing, or preventing the perfection of, the operation of the engine, because the next incoming supply of fresh gas into the valve-chest and common conduit necessarily became admixed with the residue of the dead-gas from the preceding operation, and the highest efficiency of the engine was not derived.

The principal object of the present invention is to so construct the engine shown in the engraving (having the endwise oppositely arranged cylinders, each having a piston therein, operating upon a single intermediately disposed crank-shaft, the outer ends of both cylinders being closed, and provided with a common bow-shaped extension conduit connecting the closed outer end of both cylinders, and serving as a continuation of the cylinders), with means separate from the common conduit cylinder extension into and through which the gas is introduced and conveyed, for the exhaust and discharge of the dead-gas or residue, and all with the necessity of employment in the organization of the engine of but a single exhaust-valve and its operating mechanism and fittings, of but a single inlet-valve and fittings, and of but one igniting or spark-producing device. Another object is to provide for gas-engines mechanism combining both the exhaust-valve operating devices and the means not only for producing the igniting spark within the explosion chamber, but for regulating or determining at will the exact instant at which the explosion will take place for the most satisfactory results. A further object is to provide for gas-engines an improved form of valve adaptable both as the admission-valve and the exhaust-valve.

APPLICATIONS FOR LETTERS PATENT.

1815.—Davies, I. R., "Incandescent gas-burners." Jan. 29.
1827.—Lane, H., "Internal combustion motors." Jan. 29.
1845.—Simmance, J. F., and Abady, J., "Gas-meters." Jan. 30.
1893-4.—Haddan, H. J., "Retorts." A communication from A. G. Clark. Jan. 30.
1941.—Wright, J. W. B., and Darwin, H., "Gas-fires." Jan. 31.
1959.—Boult, A. J., "Production of water gas." A communication from E. Fleischer. Jan. 31.
1976.—Grierson, G., "Gas-meters." Jan. 31.
1996.—Dresser, S. R., "Stopping leaky joints in gas or other pipes." Jan. 31.
1997-9.—Dresser, S. R., "Pipe-joints." Jan. 31.
2063.—Sugg, W. T., "Incandescent gas lighting." Feb. 1.
2094.—Lyncker, G. A., and Mohr, M. L., "Indicating the presence in the atmosphere of coal gas or other gases." Feb. 1.
2099.—Snell, F. A., "Burners for incandescent gas lighting." Feb. 1.
2100.—Welch, W., "Incandescent mantelet gas-fires." Feb. 2.
2138.—Coxeter, S. & H., "Gas-stand." Feb. 2.
2145.—Voysey, A. A., "Working valve-controlled mechanism from a distance." Feb. 2.
2146.—Dewrance, J., and Paul, J. H., "Desulphurization of sulphuretted hydrogen." Feb. 2.
2161.—Cope, G., "Acetylene gas-valves." Feb. 2.
2170.—Barralet, T. E., "Valve for controlling the supply of gas to water-heaters." Feb. 3.
2184.—Jeffery, F. W., "Incandescent gas-lamps." Feb. 3.

New Gas-Works at Zurich.—New works have lately been constructed for the supply of Zurich with gas. The plant, which is all of modern type, is equal to the production of 3½ million cubic feet of gas per day; and the three gasholders will store 900,000 cubic feet. The works have cost £320,000.

The Higham Ferrers Water Bill—The Bill promoted with the object of obtaining power to form a Company for the supply of Higham Ferrers and neighbouring parishes with water, has aroused a good deal of local dissatisfaction; and it has been decided, at a meeting of the representatives of the parishes, to strongly oppose the measure in both Houses. The promoters recently informed the Wellingborough Urban District Council that they were willing to exclude Wollaston and Irchester from their operations, and also to omit from clause 27 the words which give powers to the Company to take water from any other parish except those in which the works are to be situated. The Council thereupon decided not to oppose the measure.

Water Supply and Storage at Morley.—In a report to the Morley Corporation on the past year's work in the Water Department, the Borough Engineer (Mr. W. E. Putman) states that, should the consumption of water increase at the same rapid rate in the future as in the past, it was only a question of a few years before the Corporation would have seriously to take in hand the question of providing additional storage and means of delivery to the town. With regard to the work of reconstructing the Bruntcliffe service reservoir, he said that his previous explanations of the probable causes of leakage had been, and were continually being, substantiated as the work of reconstruction proceeded, and that up to the present time there had not been the slightest cause to suppose that the leakage was due to mining operations.

Gijon Gas Supply.—The Asturian Industrial Society have become the owners of the gas-works of the seaport town of Gijon, in Spain. In places as prosperous as Gijon, the "Revista Minera" remarks, gas-works are always very safe speculations, and if the Society purposes entering the gas industry, no other organization is better qualified to take the necessary steps for selecting an Asturian town to be supplied with water gas alone for lighting and heating. The above-named publication adds that if a Water-Gas Company, selling gas at 1s. 9¾d. per 1000 cubic feet, succeed, it would be adopted all over Spain, and the pipe-works of Asturias would have an unlimited market. There would then, moreover, be brought into existence an important industry for stoves and cooking ranges; and the use of solid fuel in houses ought to disappear.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Little Ways of the Officials of the Gas-Workers' Union.

SIR,—The ways of the officials of the Gas-Workers, &c., Union are "peculiar" if not "past finding out." By what has recently appeared in your columns, and from other sources of information, it is clearly shown that it is important to exercise caution in holding any communication with them. If, as a matter of courtesy, a letter is sent to them, or an interview had with them, or a statement made in regard to them of the most simple and formal character—these, and such like things, are at once paraded before the men and the public generally, as evidence that the "Union" is "recognized." If a kindly word is spoken in public in commendation of the Union's legitimate objects, and the speaker further says that concessions as to work and wages could and would be given equally well or better on application from the men themselves without the intervention of the Union, a portion only of the speech is given, and all reference to the latter remark entirely omitted.

All these things, and more which might be mentioned, are done with the object of compelling the workers to join the Union, on the ground that the Union is being "recognized," and is able to dictate terms to the employers. So much is this the case that men are being intimidated and threatened in all manner of ways. It is asserted that the works are to be made too hot to hold non-Union men; and that such men are the first to be discharged by the employers, and never taken on again! What a pity it is that steady working men should be misled by these fussy officials of what is only a Strike Union. The Union provides nothing in case of sickness, or help when out of work, or assistance to bury in case of death. A very large percentage of its funds is spent on officials and cost of management; and even when a strike arises the money is not available to keep wives and children from semi-starvation, or there are no funds at all, and an appeal has to be made to public charity.

Past experience clearly proves that it is requisite, on behalf of the employers and employed, to guard against misrepresentation in dealing with Gas Union officials; and it is equally clear that it is open to question whether the Union has been the means of securing any advantages to the workmen which justify its existence. At the same time it has been proved that its methods have been very costly both to men and masters, and terribly cruel to women and children.

Difficulty is also being caused in gas works in the following manner: At the present time the plan is being adopted of appointing certain of the men to subordinate positions in the Union—thus constituting them officials. The result is that these men, "dressed in a little brief authority," almost demand to be employed, whether there is any suitable work for them or not—certainly to be first employed when there is work, and last to be dismissed when there is no work. The question of fitness is not to come in at all. In these cases, again, if the Union is in this manner recognized, the workmen have played into the hands of these busybodies, and the authority of the master or responsible manager is set at naught, and mischief caused. Such are some of the little ways of these Gas Union officials.

Feb. 9, 1900. C. N.

Gas Fountains.

SIR,—Gas fountains seem to spring up perennially. Nearly forty years ago, one M. Mongruel—a Frenchman—had an apparatus for impregnating air with hydrocarbon vapour; and, if I recollect rightly, a Company was formed, which was called the Photogenic Gas Company, Limited. The apparatus was exhibited in Bishopsgate Street; and I had some correspondence in the "JOURNAL" about it in 1862 or 1863, by which I sought to show that what M. Mongruel stated he could do, could not be proved by "the irresistible logic of facts." Nearly all of these men try to make out that, by means of their particular apparatus, they can get more out of the hydrocarbon than there is in it. I then stated that to get as much light as from 1000 cubic feet of 16-candle coal gas, burnt under ordinary conditions, from 4 to 5 gallons of gasoline would be required; and this I still say, no matter how the liquid may be manipulated.

Some time ago a well-known Member of Parliament who was interested in an air-light apparatus—the invention of a Pole—requested me to experiment with it, and to report the result. It was represented that a light of 16 candles could be obtained with 5 cubic feet, carburetted at the rate of 2 gallons of gasoline per 1000 cubic feet of air. This gentleman undertook to find £1000 if I reported favourably. An apparatus was sent to me, which I fitted up (with other plant) to enable the experiments to be conducted properly. The inventor came down, and stayed two or three days. When the experiments were concluded, the result was that 4 gallons of gasoline were required to give the duty the inventor had stated as only necessary. I believe the inventor did not mean to be wilfully incorrect; but he was himself deceived by carelessly conducted experiments. I saved my friend from having to take £1000 out of his pocket; but because I had not put £1000 into it, he grumbled at paying me a very moderate charge, and to this day I have not been fully paid.

Some little time ago there was an exhibition of another wonderful apparatus in Lombard Street—the invention of an American and a gentleman with long hair, and who looked and spoke like a German Professor of Music. I was asked by a friend to advise him as to the value of the invention. The arrangement consisted of a small blowing apparatus, to drive air into a holder for giving constant pressure; and there was a square box in the corner of the room, which, according to these gentlemen, was a sort of Pandora's box, with all the virtues inside. Lights were burning, which were represented to cost next to nothing.

I began by asking a few questions—such as, "What is the light due to?" "Oh," said the American, "that is just what our secret is. Here is some of the material, which is absolutely a new discovery." I inquired if the air took up some of the newly discovered material; but the answer was: "Are you prepared to plant $10,000 to be applied in part-purchase of the patent, in case I convince you that what I have told you can be proved practically?" My reply was: "Not exactly; but if you will plant £10,000 which shall be mine if I prove to honourable experts that you are wrong, I will not take the £10,000 if even I win, but I will take a £10 note to give to some charitable purpose."

To convince me of the wonderful properties of his newly-discovered carburetting material, he blew through a cylinder the size of a 1 lb. coffee canister; and, sure enough, there was a light. "Pro-dee-geous; you must be Mephistopheles," I said. But as I smelt not exactly a rat, I came to the conclusion that the wonderful discovery was that either fossil meal or magnesium oxide was the *corpus*, impregnated with volatile hydrocarbon; and I then thought that it was not a Mephistophelean matter, but the scheme of a 'cute yankee, aided and abetted by a German "philosopher."

The advice I gave to my friend was "Don't." I offered to have another interview with these Masters of Arts; but they told my friend that I knew a d—— deal too much for them. The light "paled its ineffectual fires," and where the inventors are now, I know not.

I come now to this latest invention of the "Gas Fountain." Like Mongruel's, it seems to be of French origin; but what there is novel about it, I cannot make out. There certainly is nothing new in having the carburetting vessel *above* the lights, so as (as it were) to syphon the air charged with hydrocarbon vapour. It will, when so charged, be much heavier than air, and will fall by its own gravity; but the supply is affected by atmospheric conditions, and will vary considerably both in quantity of gas and quality of light. But the fact cannot be got away from that, to render 1000 cubic feet of air illuminating, there must be at least 4 gallons of hydrocarbon in the form of vapour. That is the difficulty; for, if even the air be denuded of its moisture before it comes in contact with the gasoline, it cannot carry the vapour through any great length of pipe without dropping a considerable quantity *en route*.

St. Neots, Feb. 9, 1900. GEORGE BOWER.

The Registration of Gas-Liquor Works.

SIR,—One is unfortunately reminded at this season of the year that a fee of £3 must be paid to the Local Government Board for the registration of gas-liquor works under the Alkali Act. I think this tax a most disproportionate one, and in the case of small works it becomes a very heavy item per ton on the sulphate produced. In my own case, it amounts to about 4s. 6d. per ton of salt made; and in a works I know of, producing about 4 tons of sulphate per annum, the charge becomes 15s. per ton. It seems manifestly unfair that works turning out this small quantity of sulphate should have to pay the same fee as the large works which produce several thousand tons of salt per annum; and I think it is a matter well worth taking up by one of our Gas Associations. Representations might be made to the Local Government Board or to the proper authorities, pointing out the anomaly of the thing, and trying to obtain either a proportionate fee or else a nominal fee for small works producing less than (say) 50 tons per annum. Surely a simple registration fee of 10s. 6d. would suffice for this purpose; and I think the authorities would probably concede the matter, were it laid before them in an intelligent and powerful manner.

Bridport, Feb. 8, 1900. J. H. CORNISH.

The Treatment of the Spent Acid from the Washing of Crude Benzol.

SIR,—Can any of your correspondents suggest a cheap and efficient method of dealing with the spent acid formed in washing crude benzol? At the gas-works with which I am connected, we have to get rid of about 100 gallons weekly. There is a waste-heap a few hundred yards away, where the stuff can be run off. The method in use now—viz., running into 40-gallon casks which are rolled away and emptied through the bung-hole—is expensive and nasty, as the casks are speedily rotted, and there is a constant morass of spent acid near the washer. I have tried a larger cask; but the stuff, if not quickly emptied, goes partially solid, and will not pass the bung-hole. A lead-lined tank is expensive; earthenware, brittle; cast iron, very heavy; and wrought iron would, I imagine, soon be corroded.

If you can give this letter space in the "JOURNAL," I am certain to receive some valuable suggestions.

Feb. 8, 1900. R. C. S.

Gas-Stoves and Coal Prices.

SIR,—Travelling into the City a few days ago with a friend who holds a prominent position in the coal trade, I naturally asked him the cause of the exorbitant prices of coal this winter, and was met with the reply: "Why, the penny-in-the-slot gas-meters." Upon asking for an explanation, my friend made the following statement: "We sell hardly any coals for household purposes during the summer months, owing to the increased popularity of the penny-in-the-slot gas-meter for cooking and general domestic purposes. Therefore we have to make our profits for the year during the winter." As this seems very feasible, coal merchants must take care, or they will get beaten at their own game; for at the present time the gas companies throughout the kingdom cannot keep pace with the demand for gas-fires, cookers, &c. Paterfamilias finds gas at 2s. 1d. per 1000 cubic feet cheaper and cleaner to use than coal, at its present prohibitive prices—saving time, labour, and much worry. In the near future, therefore, we shall be able to dispense with the coal merchant all the year round.

Feb. 9, 1900. NO COAL.

Gainsborough Water Supply.—On Monday last week, the Gainsborough District Council decided to borrow, with the sanction of the Local Government Board, a further sum of £8400 for artesian well purposes. The Chairman of the Water Committee said he hoped this would be the last time they would have to come to the Council for money for new works. They had spent on an old borehole £4733, and on a new boring £5750; while land had cost £1000, machinery for the old boring £2856, and a reservoir, water-tower, &c., £7490—making a total of £21,829. They hoped £8400 would complete the work.

PARLIAMENTARY INTELLIGENCE.

PRIVATE BILLS (SESSION 1900).

Last Tuesday, the Chairman of Ways and Means of the House of Commons (the Right Hon. J. W. Lowther) reported that he had conferred with the Chairman of Committees of the House of Lords (the Earl of Morley) for the purpose of determining in which House the respective Private Bills of the Session should be first considered. It was decided that the following Bills should originate in the Upper House:—

Barnsley Corporation Bill, Bristol Water Bill, Bury and District Water (Transfer) Bill, Cleethorpes Gas Bill, Dorking Water Bill, East Shropshire Water Bill, East Stirlingshire Water Bill, Edinburgh Lunacy Board (Water) Bill, Exmouth and District Water Bill, Exmouth Urban District Water Bill, Falkirk and District Water Bill, Falkirk Corporation Bill, Fishguard Water and Gas Bill, Glyncorrwg Urban District Council Gas Bill, Great Berkhampstead Water Bill, Gwyrfai Rural District Council Water Bill, Hemel Hempsted Corporation Water Bill, Higham Ferrers Water Bill, Kingston-upon-Thames Gas Bill, London Sea Water Supply Bill, Margate Corporation Bill, Menstone Water (Transfer) Bill, Morley Corporation Bill, Motherwell Water Bill, Mountain Ash Water Bill, Newport (Mon.) Gas Bill, Otley Urban District Council Water Bill, Paignton Urban District Water Bill, Ramsgate Corporation Improvements Bill, Rotherham Corporation Bill, Salford Corporation Bill, South Essex Water Bill, South Essex Water Board Bill, Walsall Corporation Bill, Westgate and Birchington Water Bill.

The following Bills will therefore originate in the Lower House:—

Aberdeen Police and Improvement Bill, Airdrie, Coatbridge and District Water Trust Bill, Bedford Gas Bill, Bradford Corporation Bill, British Gaslight Company (Staffordshire Potteries) Bill, Cambridge Corporation Bill, Chelsea Water Bill, City of London (Various Powers) Bill, Crowborough District Water (Gas Transfer) Bill, Dublin Corporation Bill, East London Water Bill, Gaslight and Coke Company Bill, Gaslight and Coke, Commercial Gas and South Metropolitan Gas Companies Bill, Glastonbury and Street Gas Bill, Glastonbury Corporation Gas Bill, Grantham Gas Bill, Halifax Corporation Bill, Hamilton Burgh Bill, Hartlepool Gas and Water Bill, Hastings Corporation Bill, Ilfracombe Improvement Bill, Lambeth Water Bill, Lea Conservancy Bill, London Water (Purchase) Bill, London Water (Welsh Supply) Bill, Lymington Corporation Gas and Electric Supply Bill, Maidenhead Gas Bill, Metropolitan Water Companies Bill, Mid-Kent Water Bill, Morecambe Urban District Council (Gas) Bill, Newtown and Llanllwchaiarn Urban District Gas Bill, North Warwickshire Water Bill, Oldham Corporation Bill, Ossett Corporation Gas Bill, Ossett Gas Bill, Redhill Gas Bill, Rickmansworth and Uxbridge Valley Water Bill, Rugeley Gas Bill, St. Albans Water Bill, Scarborough Corporation Bill, South Metropolitan Gas Bill, Southport Extension and Tramways Bill, Southport Water Bill, Spalding Urban District Council Water Bill, Sutton District Water Bill, Taunton Corporation Bill, Tottenham Urban District Council Bill, Wandsworth and Putney Gas Bill, West Bromwich Corporation Bill, Wetherby District Water Bill, Wolverhampton Gas Bill, Woodbridge District Water Bill.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Thursday, Feb. 8.

(*Before Mr. Justice* BUCKLEY.)

The Welsbach Incandescent Light Company v. The New Sunlight Incandescent Company.

This was the first of two actions between the above-named Companies, the hearing of which has for some considerable time been looked forward to with great interest.

Mr. FLETCHER MOULTON, Q.C., Mr. T. TERRELL, Q.C., Mr. ROGER WALLACE, Q.C., and Mr. WALTER appeared for the plaintiffs; Mr. BOUSFIELD, Q.C, and Mr. NEIL represented the defendants.

Mr. MOULTON, in opening the case, said this was an action for infringement of the patent of 1886, for the use of oxide of thorium in incandescent mantles. The defence did not raise the ordinary list of defences; but it denied the practicability and utility of the invention, and also infringement. This was the second in order of the important inventions by which Dr. Auer von Welsbach had created the present system of incandescent gas lighting. Before his first patent in 1885, incandescent lighting was practically confined to the limelight or similar arrangements with a block of magnesia; it being well known that a solid body which would stand being raised to an extremely high temperature would give out more light than gases at the same temperature. The merits of the original invention were several; but the two principal features were these: First, a totally new mode of preparing the incandescent body to be heated; and, secondly, the discovery of a new class of bodies—the rare earths—out of which it could be formed. The learned Counsel then minutely described the method of preparing mantles, and the materials—zirconia, lanthana, &c.—employed in their manufacture. Welsbach still continued his researches, until at the present day 1 cubic foot of gas per hour could be made to give a light of 20 candles; whereas at the date of his first patent, only 3 candles was produced. But this was not done all at once. The first step, which he had just described, was the most important; and the next most important probably was that which formed the subject of the patent now in question—the discovery of a new body, a rare earth, but of a different type to those mentioned in the first patent, which possessed certain great advantages for the making of mantles. This substance was oxide of thorium, which up to then was hardly known out of chemical museums, had never been used, and had never been referred to in connection with lighting. Thorium had the great advantage that it made a tough, strong mantle; but it had the disadvantage that it gave a comparatively small amount of light. Some years afterwards, it was discovered that, by the addition of a very small percentage of another rare earth, cerium, to thorium, mantles were produced giving a light far superior to anything before known, though the reason for this remarkable change was even yet unknown, and he would not attempt to explain it. Of course, he could not claim this later discovery as being embodied in the patent; the discovery was made in two stages. In the present patent, the use of thorium for making a strong mantle was claimed; and the utility of the invention was vastly increased when the means of making it highly illuminating were discovered.

Justice BUCKLEY asked if the effect was that the discovery of 1886 was not useful, because thorium was a bad incandescent, but it became useful by the addition of cerium later.

Mr. MOULTON said the first patent had utility, but not such great utility as it acquired afterwards. He then went on to describe the defendants' mode of manufacturing mantles out of threads of artificial cotton, made of cellulose dissolved in collodion, which he thought might be relied on to show that there was no infringement; and he said the infringement alleged was not in the mode of manufacture, but in the materials employed. The defendants practically made a thorium mantle, to which they added something which made it more brilliant. He then read from the specification of 1886 the list of substances described as useful for making incandescent mantles, which included pure thorium oxide and various mixtures in which it formed the principal ingredient. This was the first mention of thorium for such a purpose—in fact, no anticipation was alleged—and the use of thorium, either alone or in combination with the substances named, was claimed. The learned Counsel concluded by pointing out, and citing authority to show, that a very small amount of utility was sufficient to support a patent, especially when it was a new invention capable of development—illustrating his argument by the case of the steam-turbine.

Professor *James Dewar*, examined by Mr. TERRELL, said he had from the first been connected with the litigation respecting the Welsbach patents, and had fully investigated the subject of the rare earths and incandescent gas lighting. He found no mention of thorium in connection with lighting prior to the 1886 patent. He thought its discovery was the greatest step ever made in incandescent gas lighting, because it enabled thoroughly practicable, portable mantles to be made. He had tried all the mixtures mentioned in the patent. They were all practical, and gave a light very similar to that obtained from the prescriptions mentioned in the 1885 patent. A pure thorium mantle gave light, but not a good light. He knew the analysis of the defendants' mantle made by Mr. Ballantyne. One analysis gave oxide of thorium 89·93 per cent., oxides of the cerium group 0·67, oxide of calcium 9·56, and traces of oxides of iron and magnesia. Another gave thorium 98·1 per cent., cerium 0·64, calcium 1, magnesium a trace, and iron 0·25. In one case there was lime, and in the other substantially none; but it made little difference, as the lime would very soon disappear at the high temperature employed. Such mantles were substantially oxide of thorium.

Cross-examined by Mr. BOUSFIELD: The mantle containing the lime was, to all intents and purposes, thorium directly it was used, because the lime would volatilize. Assuming the lime remained, it would represent one of the mixtures. The lime might be taken as an equivalent for magnesia, to which it was nearly allied, and which was mentioned in the patent. Magnesia was not so volatile as calcium; and the proportion prescribed in the patent was much more than 9 per cent. In comparison with thorium, lime was very volatile; magnesia less so. Thorium was one of the least volatile; and lanthanum and yttrium very slightly so. Alumina was less volatile than the alkaline earths, such as lime and magnesia. One prescription in the patent, to give a yellow light, was a mixture of the oxide of thorium to magnesia and alumina. He could not say whether, after long burning, the thorium would be hardly affected, the alumina a little, and the magnesia the most. The oxides might behave somewhat differently when mixed from what they did individually. He had not investigated that problem. He had seen a mantle made entirely of alumina; and it was very strong, but gave practically no light. A mixture of zirconia and alumina made a strong mantle. He remembered such a mantle being produced in the first Sunlight case, which gave a good light when sprayed with chromium. He could not agree that the 1885 patent had no commercial utility. It was the basis of the whole system, though it took a long time to reach its present development. The standard for the illuminating power of coal gas was 3¼ candles per cubic foot per hour. A mantle made according to the 1885 patent gave 4 candles, if made of cerium, lanthanum, and yttrium; or if made with zirconium and lanthanum, 4·5 candles. With Siemens and Wenham burners, a light of 8 to 10 candles per cubic foot could be obtained. A mantle of pure thorium oxide gave from 3 to 4·4 candles. The thorium was not absolutely pure, but contained traces of cerium.

Friday, Feb. 9.

Professor *Dewar*, in further cross-examination, said cerium was exceedingly difficult to separate from the rare earth oxides entirely. A sample of pure thorium sent over by Dr. Welsbach gave a light of 1·3 candles. To this different proportions of cerium had been added; but he could not state the exact increment of light obtained by the addition of $\frac{1}{10}$, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, and 1 per cent. of cerium. The figures might be found by interpolation in the luminosity curve that had been obtained. He could not say that 0·25 per cent. of cerium would give 6·5 candles; but it would probably be somewhere about that. The illuminating power of the purified thoria of 1886 was from 4·3 to 3 candles. Witness was then cross-examined as to the sources of thorium and its mode of preparation. He said the principal source was the mineral known as thorite or orangite, which was practically a silicate of thorium. He quoted some analyses from "Watts's Dictionary," the edition of 1868; but they contained no mention of cerium. The amount was so small that it was neglected. He believed the proportion would be about 1 to 2 per cent. There might have been this amount in the sample he took; it was purified by the most approved method. It was first dissolved in hydrochloric acid, which separated the silica.

Then it was treated with sulphuretted hydrogen to get rid of sulphides. After this the whole of the rare earths were precipitated with sulphuric acid, and dissolved in oxalic acid, which produced oxalates of the whole group of rare earths. There were then two methods known of separating thoria, the best of which was precipitation by hyposulphite of soda—leaving the cerium, yttrium, &c. The other method was separation as double sulphates, which was not so exact. It was now known that a certain amount of cerium was precipitated with the thorium; but in 1886 this was not known—the thorium was supposed to be quite pure. It did not contain more than 0·25 per cent. of impurities, and that might be termed pure. He knew now that by a repetition of the process, and using high dilutions, the purity was increased. At the time he experimented, he only precipitated once. The amount of cerium left in depended to some extent on the care with which the operation was conducted. With regard to the other mixtures mentioned in the specification, he made use of the same thoria as that employed for No. 1. There were two sets of experiments—one with the pure thoria obtained from Welsbach, the other with thoria prepared by himself and Mr. Ballantyne. The zirconia, lanthana, &c., were not specially purified. He felt certain they contained no cerium. The results as to luminosity were: No. 1, 1·3 candles; No. 2, 1·2; No. 3, 2·46; No. 4, 2·5, or with cerite earth instead of lanthanum, 5·14; No. 5 he had not got; No. 6, 0·66; No. 7, 2·8; No. 8, 1·8; No. 9, 2. If a small amount of cerium were added to any other mixtures, the candle power was multiplied several times. These were the experiments made with thoria sent by Dr. Welsbach. With thoria of their own manufacture, the results were as follows: No. 1, 3 candles; No. 2, 1·3; No. 3, 3·3; No. 4, 4·2; No. 6, 1·1. He did not try the other numbers, which were for coloured lights. It was now known that a good general test of the amount of cerium present in a sample of thorium oxide was the amount of light it would give. He should not rely on it as a test. He did not experiment on the addition of certain proportions of cerium. It was not until 1893 that it was known that a pure thorium mantle gave hardly any light. He could not say that for some years after 1886 it was supposed that pure thorium oxide gave a better light than any other pure oxide.

Mr. Bousfield then read some figures given by Mr. Mackean in a paper in 1891, in which the luminosity of pure thorium oxide was put at 25 candles.

Witness said he did not remember it. In the original patent, the zirconia was a dominant factor. He could not say that the other ingredients were relied on to give the light. The effect of the 1886 patent was to substitute thorium for zirconium. It also pointed out that thorium oxide might be used by itself. The great point was that thorium made a rigid mantle when incandescent; it did not contract or alter its shape as the zirconia mixtures did. No. 2 prescription gave a flexible mantle. Flexibility was put as a good quality. A thing could not be rigid and flexible at the same moment, in the ordinary sense. He did not suppose Welsbach intended to convey the reverse of flexibility, but that it would not contract. By rigid, he meant flexible. Perhaps the translation was not exact. Mantles might be used with non-illuminating gas—such as water gas. The point was to get a flame of high temperature. He did not know of any use in this country of water gas for illuminating purposes directly; it was employed after enrichment with hydrocarbons. Fahnejelm combs used with water gas gave about 4 candles per cubic foot. The process used by the defendants for making the mantles was not, in his opinion, the same as that used for the Clamond threads. The baskets were made of magnesia expressed through small orifices. They were very fragile. The Fahnejelm comb was manufactured in a similar way. The defendants made a mixture of collodion with the oxides.

Mr. Moulton said it would be convenient to put in the description of the process given in answer to interrogatories, which he proceeded to read. From this, it appeared that the solution of thorium and cerium in the proper proportions was added to the solution of cellulose, from which the threads were formed, and then woven into mantles and burned off. He added that since the writ the defendant Company had been reconstructed.

Cross-examination continued: Witness had read the description. He did not see the analogy between that and the Clamond process; it was no more like that process than it was like Welsbach's method of impregnating a cotton thread. The artificial cotton was a support for the oxides, in the same way as the natural cotton was in Welsbach's mantle. It was a far-fetched analogy to compare the collodion to the gum or glue used in the Clamond process. Some photographs of mantles were shown to witness, representing (magnified) the appearance before and after burning. He said the amount of shrinkage was rather startling. The structure of the cotton fibre was visible in the burned-off mantle. Photographs of the defendants' mantles were then shown. When burned off, some of the threads broke; but sufficient remained to hold the structure together, leaving a rod of oxide. Artificial silk could be impregnated with salt solutions, given time. He did not suggest that in defendants' case the artificial cotton was impregnated in this way, because the other mode was easier. He agreed that the 1886 patent pointed out that if one dealt with thorium, as he did with zirconium in the former patent, it would give similar results. It had no reference to any suggestion that thorium could be used in the manner Clamond had proposed. It was common knowledge that oxide of thorium, like all irreducible bodies, would give light when heated. The mantle with 9 per cent. of calcium would be equivalent in some respects to prescription No. 2, putting lime instead of magnesia. He did not agree that all the rare earths might be taken as equivalents. For certain purposes, and within certain limits, they were the same with magnesia and lime. He considered that a mantle made of 99 per cent. of thorium and 1 per cent. of cerium came within the patent—say, within prescription No. 1. It was substantially an oxide of thorium mantle. Thorium with 1 per cent. of cerium in it would not have been considered pure thorium in 1886. The discovery was made in 1893 that a small percentage of cerium had a wonderfully stimulating effect on thorium. In 1886, Welsbach might have said that 99 per cent. of thorium and 1 per cent. of cerium would not do. He suggested the use of thorium as pure as it could be obtained. Welsbach warned people in 1885 against cerium; and the 1886 patent could not be understood apart from the former one. In 1886, pure thorium meant no greater impurity than 0·25 per cent. At that date methods of purifying thorium were well known. The method of purification described by Bunsen in 1875 had not been improved upon; but it would be utterly impracticable for commercial purposes. There were other processes also.

Re-examined by Mr. Moulton: However the thorium was purified, a mantle made of the oxide was rigid when incandescent, and would be so if it contained impurities up to 1 per cent. He repeated his opinion that there was no similarity between Welsbach's invention and Clamond's. There was practically no difference between the defendants' method of manufacture with artificial cotton and Welsbach's with natural cotton. Thorium belonged to neither the ytterite nor the cerite group. Its use had never been suggested before this patent. He himself had never seen thorium until he was engaged in the litigation on the 1885 patent.

Mr. *Horatio Ballantyne* was next called and examined by Mr. Terrell. In 1886, what was considered pure thoria always contained certain impurities, including ceria. In conjunction with Professor Dewar, he examined samples. One had a total impurity of 0·2 per cent., of which 0·05 was ceria. He had made experiments on the luminosity of mantles manufactured according to the prescriptions in the patent. The thoria employed was that they had determined to contain 0·05 of ceria. No. 1 gave 3 candles; No. 2, 1·3; No. 3, 3·3; No. 4, 4·2; No. 5, 3; No. 6, 1·1; No. 7, 2·8; No. 8, 1·8; No. 9, 2. In No. 4 he made an experiment, substituting cerite earth for lanthanum. It gave 6·5 candles. He also tried it substituting yttria for half the lanthana; the result being 4·5 candles. Subsequently using pure thoria derived from Dr. Welsbach, the result was 1·3 candles, as stated by Professor Dewar. He found that thoria gave a very rigid mantle. After burning, the sides did not collapse or swell out, as some mantles did. This was extremely important in incandescent lighting, because if the mantle got distorted it did not remain, as it should, in the hottest zone of the flame. No other single oxide had the same property; and therefore the use of thoria was the foundation of the success of the system. Mixtures of thoria possessed the same quality approximately in proportion to their percentage of thoria. He knew the method of manufacture adopted by the defendants. The nitrates of thorium and cerium were partly dissolved and partly suspended. The fabric produced was practically the same as Welsbach's. He had made mantles in this way. He had also made them of artificial silk obtained from Besançon, dipped them in aqueous solutions of the oxides, and burned them off. He produced mantles made in this way. He had analyzed defendants' mantles, and they contained 9 per cent. of lime. The lime quickly volatilized.

Cross-examined by Mr. Bousfield: He had a curve of luminosity showing the candle power given by mantles with varying proportions of cerium added to pure thoria. One per cent. gave 18 to 20 candles, $\frac{3}{4}$ per cent. 14½, ½ per cent. 13, ¼ per cent. 10½, and 0·1 per cent. 5·3. These were the average results of a number of experiments. The tests were taken in the ordinary Bunsen-Letheby photometer. He believed the pressure was ½ inch, but was not sure about that. At any rate, the tests were made under uniform conditions, in the same way as all mantles were tested. The pure thoria prepared contained 2·5 per cent. of impurities, of which about ½ per cent. was ceria; the amount of the other impurities was not determined individually. He could not say what increase of luminosity would be occasioned by the quantity of ceria. In 1886, and for some years afterwards, thorium oxide was supposed to give a good light by itself. He had no doubt Welsbach himself thought so—not realizing the presence of cerium. In 1891, Mr. Mackean said pure thoria would give a light of 8 candles; but he did not think Welsbach expected so much as that. In 1886, Welsbach said that of all the separate oxides used for incandescent purposes, thoria was the one which possessed the greatest power of emitting light. There was no doubt now that the power was due to the presence of impurities. Two specimens of pure thoria were prepared by Professor Dewar and himself. It was done at the plaintiff Company's premises, and from material supplied by them. He believed the two parcels of thorite earth came from different sources. In the first place, they made a fairly large quantity; the second experiment was merely corroborative, and the quantity was less. A pure thorium mantle was not entirely useless. It could be used with water gas or Dowson gas; he had done it himself. He did not suggest that it had been done practically. There were other means of obtaining light from a non-luminous gas which might be preferable. For ordinary use with coal gas, a pure thorium mantle was useless; but the addition of 1 per cent. of cerium made it the best mantle known. Both rigidity and flexibility were useful; flexibility in forming the mantle, and rigidity afterwards. A thorium mantle was flexible under a very high temperature; and when in the ordinary bunsen flame, it was rigid. A mantle according to No. 2 prescription rapidly shrank and deteriorated. No. 6 was somewhat similar. He had analyzed defendants' mantles. One contained 9 per cent. of lime; another 1 per cent. The last was one sent by Mr. Duncan as representing what defendants proposed to make. The first was handed him by Mr. Mackean. He thought the defendants' mantle came substantially within the first prescription in the patent if it had 99 per cent. of thorium; and if it had 9 per cent. of lime, within No. 2. Anything which was substantially thoria and gave a good light, he should regard as coming within the patent. If 99 per cent. of thoria and 1 per cent. of didymium gave a good light, he should say it was within it; if it could not be called an illuminating appliance, it would not be within it. Iron had a deleterious effect; 1 per cent. would probably spoil any mantle, and it was a common impurity in these oxides.

Re-examined by Mr. Moulton: The claim was for oxide of thorium, or in admixture with other oxides. The statements in the patent about the various mixtures were accurate. There was no doubt he had durability in his mind as a very desirable quality. Thorium was the most durable of all known substances employed for this purpose. In 1886, it was the rarest metal—hardly known at all.

Mr. Moulton stated that was the plaintiffs' case.

Mr. Bousfield said his friend had not proved infringement. He wanted to see Mr. Mackean in the witness box.

Mr. Moulton understood infringement was admitted on the pleadings; they admitted the sale of mantles to Mr. Mackean. He also read the answers to the interrogatories. Mr. Mackean was not in England.

Mr. Bousfield said he did not object to an adjournment; but if his friend left his case there he should offer no evidence, and submit there had been no case made out. The defendants had never manufactured at all.

Justice BUCKLEY said it was not denied in the answers to interrogatories that the defendants had manufactured.

Mr. BOUSFIELD said the answer was that, according to their information and belief, the mantles complained of were manufactured in a certain manner.

A considerable discussion ensued; Mr. Bousfield submitting that the plaintiffs had not proved either manufacture or sale, and that there was no admission of manufacture.

His LORDSHIP having intimated that, in his view, there was an admission of manufacture,

Mr. BOUSFIELD proceeded to argue the merits of the case on the evidence as it stood. He submitted that Welsbach's method of impregnating cotton fibre with a solution was totally different from that adopted by defendants in making a plastic substance containing the necessary materials, which was formed into fine threads in the same way as artifical silk was produced. He quoted from the 1885 patent to show that Welsbach's claim was confined to impregnating the fabric by dipping it in a solution; this process being incorporated in the 1886 patent. He had not concluded his address when the Court rose.

Saturday, Feb. 10.

Mr. BOUSFIELD (continuing his speech on behalf of the defendants) pointed out that mantles, as sold, contained 9 per cent. of lime, though the greater proportion of the latter might disappear soon after they were used by customers. Such mantles had been described by Professor Dewar as corresponding with prescription No. 2, which was 3 parts thorium oxide and 2 parts magnesia, and was said to give a flexible hood. No evidence had been given as to the rigidity or flexibility of defendants' mantle. If it were said to infringe prescription No. 1, it must be shown to be rigid: but to infringe No. 2, it must be flexible. Reading the whole specification, it looked as if Welsbach desired to attain flexibility. He cited one or two authorities dealing with the question of equivalents, and said there was no evidence whatever that a mixture of 90 per cent. thorium and 9 per cent. calcium was an equivalent to 60 per cent. thorium and 40 per cent. magnesia—still less that it was known in 1886 to be an equivalent, which was the real question. He further pointed out that if calcium, magnesium, and aluminium were to be treated as equivalents, prescriptions Nos. 2 and 6 would give the same results (No. 2 being 3 thorium and 2 magnesia; while No. 6 was 3 thorium, 1 magnesia, and 1 alumina), which they evidently did not. If it were suggested that defendants infringed prescription No. 1 for pure thorium oxide, because when the lime had volatilized the mantle was practically 99 per cent. thorium and 1 per cent. cerium, the answer was that the addition of 1 per cent. of cerium made all the difference between 1·3 and 20 candles; and the two things, therefore, could not possibly be equivalents. In former actions, the plaintiffs had relied on their right to have the chemical ingredients pure; but now they were relying on the impurities in thorium to support the patent. He submitted that the word "pure" in prescription No. 1 must be given due effect to, and went on to press the same point on the question of utility. The whole claim was, by reference to the 1885 patent, for a mantle giving a brilliant light; but pure thorium gave hardly any light. The learned Counsel also contended that there was nothing in the specification to show that durability was a point specially aimed at. The patent was for an improvement on the previous one; and it was substantially from the discovery that thorium might be substituted for zirconium. But this really gave much less light; and therefore it had no utility. In a pioneer invention, it was true, commercial utility was not the test—the smallest possible utility capable of development would support a patent. But it was quite different with patents for improvements. In connection with this point, he urged that prescriptions Nos. 2 and 6 were absolutely useless according to Mr. Ballantyne's evidence. He then cited authorities to show that a patent could not be granted for the use of a new substance generally to a known purpose; it must be for the mode of application. The learned Counsel submitted that the defendants' mode of application was quite different to that of the plaintiffs. This led to a comparison of the Welsbach skeleton mantle—which was a simulacrum of the structure of cotton thread which had been impregnated with the solution—with the expressed threads of plastic material used by defendants. This process was a development of the lines followed by Clamond and Fahnejelm, which Welsbach had left, and gone in an entirely different direction. On the whole, the learned Counsel submitted that the patent was invalid on the ground of non-utility, and that, neither as regards the matter of prescription nor process, had the defendants infringed. Of course, he also submitted, as he did at the outset, that plaintiffs had proved neither sale nor manufacture by the defendants.

Mr. MOULTON then commenced his reply by submitting that the question of subject matter not having been raised, it was not open to his friend to argue that the construction of the patent must be guided by any consideration of patentability or not. At the same time, he did not agree with the statement of the law as put by Mr. Bousfield. After discussing this question for some short time, the case was again adjourned.

Monday, Feb. 12.

Mr. MOULTON this morning resumed his reply, and dealt first with the construction of the specification. The patentee claimed the use of thorium alone, or in admixture with zirconium and a number of other substances. He did not think the words "substantially as herein described" applied to the mode of manufacture of the hoods. He submitted it was a claim to the use of thorium in hoods prepared for illuminant appliances, without regard to the mode in which they were made. He next argued at some length the question of utility; submitting that each prescription gave a result which might be useful for some purpose—either flexibility, cheapness, or colour. He contended that "pure thorium" simply meant thorium alone, not absolutely pure, but substantially so, and not purposely mixed with other substances. At the date of the patent, the thorium used by Welsbach was considered pure; being extracted in the ordinary way. The learned Counsel went on to submit that the use of a mixture of 99 per cent. thorium and 1 per cent. cerium was an infringement of the patent for pure thorium; and he concluded his speech by saying, in answer to his Lordship, that he asked for an injunction, notwithstanding the denial by the defendants that they were manufacturing or selling.

Mr. NEILL asked leave to shortly comment on some of the cases cited by Mr. Moulton, after which,

Mr. TERRELL added a few remarks on the form of relief, on which some discussion ensued. He asked for an injunction against the Directors individually, so that it might practically be operative against the new Company, and also to make them liable for costs. He further asked for costs as between solicitor and client, on the ground that the validity of the patent had been previously established in another case. He put in the certificate in the De Mare action.

Mr. NEILL objected that this ought to have been put in before the plaintiffs closed their case, when defendants would have met it by evidence to show that the question had not been tried and decided.

His LORDSHIP said he would give judgment in a few days.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Tuesday, Feb. 6.

(*Before Justices* CHANNELL *and* BUCKNILL.)

Dewsbury and Heckmondwike Water-Board v. Assessment Committee of Penistone Union.

This was a special case stated by the Justices of the West Riding of York. The case stated that there was an appeal against a poor-rate made on Oct. 6, 1898, by which the Water Board were assessed in respect of certain works situated within the Union of the respondents. The appellants were incorporated by the Dewsbury and Heckmondwike Water-Works Act of 1876; and the premises in question were part of the property vested in them. Upon the hearing of the appeal, the financial statements of the appellants for the two years ending March 25, 1897 and 1898, were produced. There were sales of surplus water by the appellants, and receipts for the same; and in each year a considerable profit was made by the Board after paying all the expenses, including rent, rates, and taxes. Such surplus profit was handed over by the appellants to the Dewsbury Corporation and the Heckmondwike Urban District Council respectively. It was contended, on behalf of the appellants, that by reason of the terms of the Act, no tenant would give more than a nominal rent to occupy the premises, and that the assessment should be reduced to a nominal sum. It was further contended for the appellants that, as the Act merely authorized the Water Board to receive sums of money in respect of water sold by them in bulk, and no others, the sums received by the Dewsbury Corporation and the Heckmondwike Urban District Council were not to be taken into consideration in fixing the amount of the assessment. For the respondents, it was contended that the liabilities of the old Board, to which the appellant Board succeeded by the Act of 1876, included the liability to be rated to the poor, and to be assessed in the manner and form in which the assessment appealed against was made. It was further contended for the respondents that the property occupied by the appellants yielded, or was capable of yielding, a net annual value over and above the repairs and other expenses necessary to maintain the property in a state to command a rent partly derived from the sale of surplus water by the appellants, and partly from the moneys paid to the Dewsbury Corporation and the Heckmondwike Urban District Council by the water consumers; and therefore the property was rateable upon its value, though the appellants were trustees, and derived no personal benefit from the occupation. The Justices held that the appellants' contentions were wrong, and that the premises were rightly assessed; and they dismissed the appeal with costs, subject to the case stated for the opinion of the Court. The question for the Court was whether they were right in so holding. The amount of the assessment in dispute was £9.

Mr. BALFOUR BROWNE, Q.C., and Mr. WAUGH appeared for the appellants; Mr. CASTLE, Q.C., and Mr. GLEN represented the respondents.

After hearing arguments from Mr. Balfour Browne and Mr. Waugh for the appellants, and Mr. Castle for the respondents,

Justice CHANNELL said the case did not seem to represent all the points raised.

Mr. CASTLE said this was really an appeal against the rating of an ordinary water-main which connected a reservoir with the towns which were supplied with water. In the usual way, it would be rated on structural value, as that was the principle always adopted in these cases.

Justice CHANNELL remarked that the case did not tell them anything about that.

Mr. CASTLE said the appellants entered an appeal, not only against this, but also another appeal against a reservoir in a neighbouring parish. When the case was heard, Mr. Balfour Browne for the appellants declined to call witnesses; and said it was not a question of the amount of rateable value if it was to be assessed. He, however, produced an Act of Parliament, and said upon that there was no rateable value. This was the only question their Lordships had to consider—whether the Act of Parliament had struck this main with sterility so as to take away its rateable value. He was surprised to hear such a proposition after the decision by the High Court in the Mersey Docks case.

Justice CHANNELL said the case had been stated wrongly. His strong impression was that the appellants were merely trustees to receive profits for the Dewsbury and Heckmondwike Corporations; and that the Act incorporating them was mere machinery for enabling Dewsbury and Heckmondwike conveniently to combine together. If that was so, the main must be rated upon structural value.

After further argument,

Justice CHANNELL said the appeal must be dismissed. The difficulty arose entirely from the way in which the case had been stated. It was stated apparently with a desire to get the decision of the Court upon certain points which, when they came to be considered, did not arise. The only question really raised here was as to the rating of the main; and as it appeared to have been rated according to structural value, it was rightly so rated. The appeal would have to be dismissed; but this would not in any way prejudice either party upon the question of the other appeal relating to the reservoir, nor would it prejudice an appeal against the amount of the assessment.

Justice BUCKNILL concurred.

The appeal was therefore dismissed with costs.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Monday, Feb. 5.

(*Before Justices* CHANNELL *and* BUCKNILL.)

Crystal Palace District Gas Company v. Idris and Co.

Mr. BARTLEY DENNISS appeared for the defendants, who were appellants; Mr. T. ERNEST SAUNT for the respondents.

Mr. DENNISS said this was an appeal by the defendants from a decision of a County Court Judge in an action brought against them by the plaintiffs, who claimed damages for the negligence of a driver of one of defendants' mineral water carts in knocking down a lamp-post in July last, and causing damage to the extent of 19s. 6d. As there were a great many of these cases, the defendants had thought it advisable to take the opinion of the High Court, and the Judge gave leave to appeal. He found there was negligence on the part of the driver, and the defendants did not desire to dispute this, as the amount involved was only 19s. 6d; but they wanted to bring on the appeal on the question of procedure. He had to contend that no proceedings could be taken in the Courts against the master for such a cause of action. The Crystal Palace Gas Company's Act incorporated the Gas-Works Clauses Act, 1847, and the two together formed a code of law which provided for two things, among others. First of all, the 1847 Act gave power to the Company to erect lamp-posts in highways, and under this enactment they had no common-law right to proceed—in fact, lamp-posts were "nuisances" which might be indicted. Further, sections 19 and 20 provided a code by means of which all injuries to these lamp-posts were guarded against, and the remedy prescribed against the persons who damaged them. Section 19 specified that "every person who shall wilfully remove, destroy, or damage any pipe, pillar, post, plug, lamp, or other work of the undertakers for supplying gas . . . . shall, for each offence, forfeit to the undertakers any sum not exceeding £5, in addition to the amount of the damage done." Section 20 said: "Every person who shall carelessly or accidentally break, throw down, or damage any pipe, pillar, or lamp belonging to the undertakers, or under their control, shall pay such sum of money by way of satisfaction to the undertakers for the damage done, not exceeding £5, as any two Justices or the Sheriff shall think reasonable." Their Lordships would notice that in section 20 the words "carelessly" and "accidentally" were included for the first time; so that every person who walked or drove along a street became an insurer of all lamp-posts to an amount not exceeding £5. The person who actually damaged a lamp-post could only be sued before a Magistrate; and the question here was whether the master could be sued under common law. He contended that this remedy was ousted, and that the remedy under this Statute was exclusive. It was a special remedy which was wider than anything in the common law, and therefore ousted the common law remedy. Proceedings had also been taken against the master before the Justices;* but the summons was dismissed, and the Company then proceeded in the County Court, and obtained judgment. There were, as he had said, a number of cases awaiting this decision, because all over London lamp-posts were constantly being knocked down.

Mr. SAUNT contended that the Company had a common-law remedy long before the Act was passed. If a lamp-post were a "nuisance," and any private person came along and injured it, or took upon himself to remove it, there would be a cause of action against him if it were damaged.

Justice CHANNELL said if the lamp-post were an obstruction to the highway, and a person knocked it down, he was not sure that an action would lie.

Mr. SAUNT submitted that the Company had a common-law remedy prior to the giving of this extra remedy, and therefore they were not bound down to their statutory remedy.

Justice CHANNELL said he thought the appeal must be dismissed. He did not see the slightest ground for saying that this was an exclusive remedy, or that it was intended there should be no other. It did not seem to him to exclude the ordinary jurisdiction of the Court in cases where it was applicable. As regards accidentally knocking down a lamp-post, the Act did make it an offence, and the plaintiffs could only proceed under the Act.

Justice BUCKNILL concurred.

The appeal was therefore dismissed, with costs.

The Willenhall Gas Company Fined for Deficient Illuminating Power.

At the Wolverhampton Police Court last Wednesday, the Stipendiary (Mr. N. C. A. Neville) was engaged in hearing a case in which the Willenhall Gas Company were summoned by the Willenhall District Council for supplying gas of a less illuminating power than 15 candles. Mr. R. Tildesley, the Clerk to the Council, represented that body; and Mr. R. C. E. Plumptre defended. Mr. Tildesley, in opening the case, stated that the Company contracted to supply the Council with gas equivalent to 15-candle power; and an expert Gas Examiner appointed by the Council, made periodical tests. On Dec. 29 two tests were made; the first being found to be 14·26 candles, the second 14·94 candles. Under the Act, the tests were bound to be made at the works of the Company, which in this instance were situated one mile from the town. Mr. Alfred Cresswell, the Gas Examiner, spoke to making the tests in question. In cross-examination, he said he would not swear that the illuminating power on Dec. 29 was not 15 candles. Mr. Plumptre said that, by section 37 of the Company's Act of 1892 it was provided that: "No penalty shall be incurred by the undertakers for insufficiency of pressure, for defective illuminating power, or for impurity of gas so produced by an unavoidable cause or accident." During the week covering Dec. 29, the Company were in difficulties owing to the supply of coal having been cut off. It was well known that at the time trucks of coal were standing on the railways; and as the Gas Company were unable to obtain the coal, "through an unavoidable cause," to make the finest quality of gas, they had to fall back upon stock which was something like six months old. From this coal, through it having imbibed moisture, the Company were unable to produce the finest quality of gas. The Stipendiary remarked that it was not an unavoidable cause, but avoidable bad management on the part of the Company. The Manager of the Company (Mr. Walter Cranmer) bore out the statement of Mr. Plumptre. The Stipendiary decided to convict, and imposed a fine of £1 and the costs; the total amount being £5 14s. 6d.

* See "JOURNAL," Vol. LXXIV., p. 771.

The Incandescent Mantle Remover.

In the Chancery Division of the High Court of Justice last Friday, before Mr. Justice Cozens-Hardy, Mr. Everitt, Q.C., moved, on behalf of the Incandescent Mantle Remover Company, Limited, for an interim injunction to restrain the Welsbach Incandescent Gas-Light Company, Limited, from infringing their patent by using a certain appliance for removing incandescent mantles. Mr. A. J. Walter, for the defendants, said the validity of the patent was attacked on the ground that it did not contain the subject-matter of a patent, and that there was want of novelty. Mr. Everitt said, in these circumstances, if the defendants would keep an account, the motion could stand over till the trial of the action. His Lordship said the defendants would keep the ordinary books. The costs of the motion would be costs in the action.

Henley-on-Thames Gas Supply.—The demand for gas has augmented to such an extent at Henley-on-Thames that strenuous efforts have lately been required on the part of the Manager (Mr. J. Theobald) to keep up the supply. The make in the year ending Dec. 31, 1898, amounted to 18,247,300 cubic feet; whereas last year it was 22,382,400 cubic feet—an increase to the extent of 4,135,100 cubic feet. In face of this rise, the Directors have decided to extend the manufacturing plant, and have accepted the plans prepared by Mr. Theobald for the necessary alterations, which are estimated to cost £1200.

Sales of Shares.—Last Wednesday, Messrs. Waters and Rawlence sold some fully-paid £10 shares in the Fisherton Anger and Bemerton Water Company at £19 5s. each. New ordinary 8 per cent. £12 10s. shares in the Salisbury Gas Company were disposed of at £18 5s. to £18 12s. 6d. each, and 7 per cent. shares at £16 17s. 6d. and £17 apiece. A £25 5 per cent. debenture in the same Company fetched £28 12s. 6d. On the following day, Messrs. Drew and Son sold, at the Greyhound Hotel, Richmond, £390 of "A" and £230 of "B" stock of the Richmond Gas Company. There were seven £50 lots of "A" stock, five of which fetched £121, and two £122 each; one lot of £40 of similar stock realizing £100. Three £50 lots of "B" stock were sold for £120 each, one lot of £40 of stock for £97, and a similar lot for £96.

West Bromwich Gas Supply.—The West Bromwich Gas Department report that the extensions and alterations in the retort-house which were carried out during last autumn have been utilized during this winter as found necessary, and they have thus been able to meet the increased demand for gas during the months of November, December, and January. The sales of gas for the nine months of the financial year ending in December are the highest in the history of the undertaking. In consequence of the increased demand for gas, as well as the inability to obtain full delivery of the coal contracted for, owing to congestion of railway traffic and other causes, the Committee have been compelled to make additional purchases of gas coal for delivery during January and February to the extent of between 2000 and 3000 tons. The sales of gas for the Christmas quarter were 98,307,000 cubic feet; and the amount of gas-rental (excluding public lighting) was £11,546.

Hastings Water Supply.—The Mayor of Hastings (Alderman Tuppenney) last Tuesday turned on the water at one of the two reservoirs at Fairlight which are to be used in connection with the scheme for the supply of water to the borough. The reservoir, which is an underground one, is some 150 feet in diameter. The second reservoir is nearing completion, and it is intended to use them alternately, although they can each be filled in the short space 14 hours. The holding capacity is 1½ million gallons each. After the Mayor and several members of the Corporation had inspected the reservoir, and his Worship had performed the ceremony, Alderman Weston, the Chairman of the Water Committee, mentioned that the water scheme would probably cost £150,000 before it was completed; but he added that they were all agreed that if they obtained the results they anticipated, it would be money very well spent. The Mayor congratulated the Borough Engineer (Mr. Palmer) upon his work.

Wages and Holidays at the Newcastle and Gateshead Gas-Works.—The questions at issue between the Newcastle and Gateshead Gas Company and the men employed by them in the retort-houses at the works have not (according to our latest information) entirely reached the point of settlement; but they are in a fair way of doing so. Briefly the history of the affair is this: In November last, the men sent in an application for 10 per cent. advance of wages, increased holidays, and double pay for Sunday and Good Friday work. Correspondence ensued; and ultimately an interview took place between a Committee appointed by the Directors and the officials of the National Amalgamated Union of Labour, on behalf of the men, in January. A settlement, however, was not effected; and the men, numbering about 1000, handed in their notices. The notices expired last Thursday. The Company offered an immediate advance of 2½ per cent. to all grades, and arbitration on other points in order to effect an amicable arrangement; but for a time the men were not inclined to favourably view this form of procedure. After a meeting of the Directors last Wednesday, the Chairman of the Committee of Directors, along with the Secretary of the Company (Mr. T. Waddom), had an interview with two of the representatives of the men; and arrangements were made that there should be no cessation of work for a few days, and that in the meantime a vote of the men should be taken on the Directors' proposals. The result was announced on Friday night; the votes recorded being 534 in favour of arbitration, and 428 against. This means that the vote was in favour of arbitration by a majority of 106 on a total poll of 962. Accordingly the notices have been withdrawn; and the arbitration is expected to take place this week.

MISCELLANEOUS NEWS.

BRENTFORD GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Friday, at the Charing Cross Hotel—Mr. Howard Charles Ward in the chair.

The Secretary (Mr. W. Mann) read the notice calling the meeting; and it was agreed to take as read the report and accounts, of which the principal points were given in last week's issue.

The Chairman, in moving the adoption of the report and accounts, said it was with great pleasure the Directors and officers met the shareholders on this occasion, for they had a very excellent report indeed to submit to them. The amount available for dividends was £75,409; and the dividends recommended were at the rate of 5 per cent. per annum on the preference stock, 12 per cent. on the consolidated stock, and 9 per cent. on the new stock, 1881. Following this up, he would first turn to the revenue account before dealing with the other portions of the report. The amount received from the sale of gas in the half year was £126,869, against £117,497 in the corresponding period of 1898. As the shareholders would perceive, this was a considerable increase; and it was equal to just about 8 per cent. Then in the rental of meters and stoves, there was a substantial increase; the sum received being £10,372, compared with £9209. The receipts for coke, tar, and ammoniacal liquor were also considerably larger—the amount being £31,882, as against £25,703. The total of these sums, with a small amount for rents and transfer fees, was £169,163. Going to the other side of the account, the shareholders would, of course, expect to find that, with such a growth of business as they had had, there would be an increase in the expenditure on materials. On coal and oil £60,270 had been spent, as against £53,673, or about £6598 more. The great bulk of this was due to the larger quantity of material used; the price paid having gone up very little at present. The next item calling for attention was repairs and maintenance of works and plant. It was £12,493, compared with £11,778. The remark which he had to make upon this was that in the £12,493 was included a sum of £1000, being the last item of the suspense account that was created for the purpose of paying the expense of converting the system of manufacture, with the exception of one house, from horizontal to inclined retorts. In point of fact, after having changed about five-sixths of the system from horizontal to inclined retorts, they had written off the original cost of the horizontal retorts; and the capital account now only stood charged with the inclined retorts, just as though the horizontals had never been in existence. In the distribution of gas, a considerable sum had been spent on the repair, maintenance, and renewal of mains and service-pipes, and the repair and renewal of stoves. He thought it right to call attention to the fact that the cost of the meters, stoves, automatic meters, and fittings was gradually wiped out – they had, indeed, wiped out the original cost charged against capital of a good many of them. So far as the meters and automatic meters were concerned, they wrote off 10 per cent. every year; so that every one in ten years became the property of the Company without any charge against capital. With regard to stoves, they wrote off 12½ per cent. from their original cost, so that every stove in eight years became their property, without any charge to capital. With fittings they dealt in even a more liberal way, because they wrote off 15 per cent. The result of this was that their capital account, so far as these things were concerned, was in a very wholesome and strong position. Naturally, the wiping off of the cost of these appliances meant a very large sum. He believed it was about £12,000 a year; and, of course, as long as they went on fixing meters, stoves, and things of that sort (which would be as long as their business continued to increase), they would always have something of this kind to write off. They had already experienced great relief from the amount written off. They had been doing this in connection with the stoves for about eighteen years; but when the automatic meters came up a few years ago, there was a great rush for them, and great delay in getting them. Wiping off from these 10 per cent. made the item of repair, maintenance, and renewal of stoves rather heavy. Rates and taxes had also gone up a little. The total result of the half-year's business was this, that they had received £169,163, and the expenditure had been £117,953—giving a balance of £51,209. This gross profit would be sufficient to pay the dividends recommended, and to leave a balance of £11,823. From June last, they brought forward £27,386, which would enable them to carry to the next accounts £39,209. The third paragraph in the report referred to the continued and satisfactory increase in the sale of gas (amounting in the half year to 8 per cent., compared with the corresponding period of 1898), and to the fact that the automatic meter consumers were still increasing rapidly. The additional gas manufacturing plant at Southall was complete and at work; and the shareholders would not be surprised to know that, with such increases as they were having in their business, some more manufacturing plant was required at that station. It happened that, when they put up the last new plant, they provided a house large enough to accommodate another installation of water-gas apparatus. They proposed now to add to the existing plant; and they had entered into a contract with Messrs. Cutler and Sons for its erection. It was also stated in the report that more capital was wanted; and a glance at the capital account would justify it. In the past half year, although they had done very little in the way of expending money on capital account, excepting for mains and services, and meters and stoves, they had spent £8365; and they had only a balance of £7425 to the credit of capital. Now it was evident that £7425 was not sufficient to carry on a business like theirs; and if it had not been for the undivided profits (which were scattered over the business), they would have been obliged to make a call for capital before this. Then looking at the balance-sheet, it would be seen that, for the quarter ending Dec. 31 last, there was due to the Company, for gas and meter rental, £74,231. Of course, a great deal of money was required to purchase materials and to pay for the labour for making the gas which was represented by this sum of £74,231. He mentioned this to show that the £7425 which they had remaining on capital account was altogether inadequate for the necessities of the Company. Therefore the Directors proposed to issue a further portion of the 4 per cent. debenture stock. They thought this was the cheapest way of raising the money; and he did not think it would be a breach of confidence to tell the shareholders that the minimum price had been fixed at £115, which would give about 3½ per cent. The next subject was one to which he alluded with regret—indeed, more than regret. That was the retirement of his old friend, and the companion who sat by his side for so many years at these meetings—Mr. William Croxford, the late Secretary. He had been in failing health for some two or three years; and whenever he came out to do his work—and he struggled on manfully to do it—he always went home quite beaten down, and with a worse illness than he had before. Therefore, he (the Chairman) thought Mr. Croxford had been very wise in retiring from work. He had resigned with the greatest respect of the Directors and his brother officers; and they could only hope he would be spared for many years to enjoy his ease and retirement. Mr. Croxford had been 46 years in the service of the Company—a long time, but not so long as he (the Chairman) had been connected with it—and they gave him the highest retiring pension that the Board of Trade allowed: viz., two-thirds of his salary of £1000. Therefore he would take £666 13s. 4d. a year. Having lost their Secretary, they had to look about for a new one; and they were happy to say they had Mr. Mann, who was an old officer of the Company, having been with them 32 years. Well he recollected Mr. Mann coming to them from his father, who was the Engineer of the old City of London Gas Company. Knowing everything connected with the Brentford Company, Mr. Mann was likely to be a most efficient Secretary. He was well known to all of them; and they had the greatest confidence in him. A resolution would be submitted later for the purpose of fixing his salary. Proposals would also be made to re-elect the retiring Directors—Mr. R. Shafto Adair and Mr. Frank Morris. The former was a valuable Director; and about the latter it would be superfluous to say anything. He was, as he (the Chairman) liked to call him, the "apostle" of inclined retorts in this country, as he was the first man to introduce them here. The Auditors (Mr. John W. Field and Mr. M. F. Monier-Williams) also offered themselves for re-election. There was only one other matter about which he wished to make a remark, and that was with reference to coal. They all knew the state of the coal market; but he did not know the reason for it. The Company had a contract for a good quantity of coal yet, which would last them quite to the end of the autumn. If there was no change before then, they would have to pay more for their supplies. If they had to do this, the consumers would see that they would have to pay more for gas; and if they had to pay more for gas, the shareholders would suffer a reduction of their dividend.

Mr. Ulick J. Burke seconded the motion.

Mr. W. Hughes called attention to the bad debts, which amounted to £436, as against £218 in the corresponding half of 1898; and he asked whether the Company did not require a deposit from new consumers.

The Chairman thought they were very lucky to get out of such periods as these with this small amount. Considering the extent of the business, the bad debts were low; and the Directors wrote them off very liberally. They had deposits from many of the consumers; and the amount in their hands now on deposit was between £3000 and £4000. Sometimes, however, the consumers' accounts exceeded the deposit.

The motion was unanimously carried.

The dividends recommended were also declared; and a resolution was passed transferring to the reserve fund, from the £39,209 carried forward, the sum of £3250, being equal to ½ per cent. for the year 1899 in respect of the dividends on the consolidated stock. The Chairman observed that the reserve fund amounted to £4816; and the £3250 would be added to it. They did not divide up to the hilt the dividend to which they were entitled; but they paid 12 per cent. instead of 12½ per cent., and placed the ½ per cent. to the reserve fund.

By subsequent resolutions, the retiring Directors were re-elected, the commencing salary of the Secretary was fixed at £700 per annum, and the Auditors were re-appointed.

The services of the Chairman and Directors and officers having been suitably acknowledged,

On the suggestion of Mr. Hughes, the shareholders, by resolution, expressed the hope that Mr. Croxford would have improved health and long life to enjoy his well-earned rest and pension.

This concluded the proceedings.

CRYSTAL PALACE DISTRICT GAS COMPANY.

The Half-Yearly Report and Accounts.

In the report which the Directors of the above-named Company will present at the half-yearly meeting next Friday, they state that, notwithstanding the reduction in the price of gas to 2s. 6d. per 1000 cubic feet from Midsummer last—a reduction of gas-rental to the extent of £2350—the balance to the credit of the revenue account amounts to £18,909 15s., which is sufficient, after meeting all charges for interest, to pay the same dividend as before, and leave a surplus of divisible profit to be added to the reserve fund. The Directors recommend the payment of dividends at the rates of 5 per cent. per annum on the preference stock, and 5½ per cent. per annum on the ordinary stock, less income-tax in both cases. There has been the very satisfactory increase of 9 per cent. in the quantity of gas sold over the corresponding half year of 1898, due partly to a general increase in consumption, and partly to the continual growth in the demand for gas-stoves and for the supply of gas to small houses by means of "slot" meters. The Directors express their regret at having to report the death within the half year of their late esteemed friend and colleague Mr. Alfred T. Layton, who was a most capable and painstaking Director. They announce the appointment, already notified in the "Journal," of Mr. Robert Morton as his successor.

The accounts accompanying the report show that in the six months ending December 31 there was expended a sum of £22,946 for capital purposes; £16,221 being for new buildings and plant in extension of the works, £2785 for new mains and services, and £3940 for meters and stoves. The total expenditure up to the close of the year was £721,004, and only £719,582 raised (with premium capital); showing an overdraft of £1422. The revenue from the sale of gas was £70,438, as compared with £67,067 in the corresponding half of 1898; the rental of meters (15,131 ordinary and 9523 prepayment), £1802, against £1648; and of stoves (6099 ordinary and 7511 prepayment), £1649, against £1348. The

residuals produced £28,369, as compared with £23,642; and the total receipts were £102,268, against £93,715. The expenditure on the manufacture of gas was £68,245, against £57,672 (coals, oil, and labour costing £46,609, as compared with £37,553); on distribution, £7594, against £7521; on management, £3364, against £3268; and the total expenses were £83,358, as compared with £72,766. The balance carried to the net revenue account is £18,909, as compared with £20,949 this time last year. Under the supervision of Mr. S. Y. Shoubridge, the works produced in the past six months 622,004,000 cubic feet of coal gas and 8,824,000 cubic feet of oil gas—together, 630,828,000 cubic feet, against 581,994,000 cubic feet in the latter half of 1898. The raw material used was 62,184 tons of coal, 226 tons of cannel, 39,637 gallons of gas oil, and 1693 gallons of carburine. Of the total make of gas, 570,937,000 cubic feet were sold and 577,862,000 cubic feet accounted for. The following are the quantities of residuals produced: Coke, 780,125 cwt.; breeze, 13,841 yards; tar, 582,308 gallons; and ammoniacal liquor, 11,918 butts. There were 431 tons of sulphate of ammonia made and 418 tons sold; the stock at the close of the year being 84 tons.

CROYDON COMMERCIAL GAS COMPANY.

The Half-Yearly Report and Accounts.

According to the report which the Directors of the above-named Company will present at the half-yearly meeting next Friday, the quantity of gas sold in the six months ending Dec. 31 was 30,370,100 cubic feet more than it was in the corresponding period of 1898—an increase of 9·56 per cent. This was caused to a considerable extent by the augmentation in the number of consumers (400 ordinary, 842 prepayment, and 101 automatic), and the additional number of gas cooking and heating stoves supplied on hire. The receipts from residuals benefited greatly during the half year by the improved market values. On the other hand, there was a large increase in the cost of coal, iron, iron pipes, &c.; and from the present appearance of the markets, there is a prospect of a further advance in the prices before the expiration of the existing contracts next June. Additions and alterations have been, and are being, made to the manufacturing and purifying plant at the Company's works, in order to provide for the largely increased demand for gas; and the Directors have, upon the advice of their Engineer (Mr. J. W. Helps), decided to lay an additional trunk main to Purley.

The accounts accompanying the report furnish evidence of the expenditure referred to above. In the past six months, a sum of £2633 was laid out upon new buildings and plant, £1893 upon new mains and services, and £1144 on new gas-stoves. The outlay on capital account was £6621; bringing up the total expenditure to £383,271. As the total receipts at the close of the year only amounted to £372,012, this account has been overdrawn to the extent of £11,258. The Directors therefore purpose issuing some additional ordinary and debenture stock, and making a call of £2 on the Carshalton capital shares. The revenue from the sale of gas was £48,279; the rental of meters, stoves, and fittings brought in £3417; the sale of residuals produced £14,739; and the total receipts were £66,510, as compared with £59,577 this time last year. The expenditure on the manufacture of gas amounted to £35,425 (coal, oil, &c., costing £23,841, against £19,283 in the corresponding half of 1898); on distribution, to £6055; and on management, to £2226—the total expenses being £48,792, against £42,430. The balance available for distribution is £18,844; and the Directors recommend the declaration of dividends at the rates of 14, 11, and 9 per cent. per annum on the various stocks, free of income-tax. This will absorb £15,447, and leave a balance of £3397 to be carried forward. The portions of the accounts relating to the manufacturing operations show that 25,315 tons of coal, 10 tons of cannel, and 322,224 gallons of oil were used in the production of 383,536,000 cubic feet of gas, of which 347,871,200 cubic feet were sold and 352,063,100 cubic feet accounted for. The estimated quantities of residuals produced were: Coke, 15,195 tons; breeze, 3580 tons; tar, 329,610 gallons; and ammoniacal liquor, 644,004 gallons. The amount of sulphate of ammonia made was 206 tons; and 131 tons of it were sold.

BROMLEY GAS CONSUMERS' COMPANY.

The Half-Yearly Report and Accounts.

At the Half-Yearly Meeting of the above Company on the 22nd inst., the Directors will report that the business is making satisfactory progress. The quantity of gas produced in the six months ending Dec. 31 was 9½ million cubic feet more than in the first half of the year, and nearly 8 millions in excess of the corresponding period of 1898. Reference is made by the Directors to the exceptionally high price of coal; but, by way of compensation, the sales of coke and sulphate of ammonia have been at improved rates. The accounts accompanying the report show that the receipts from the sale of gas in the half year amounted to £17,570, residuals produced £6426, and the total revenue was £24,921. The expenditure on the manufacture of gas was £13,820 (coals costing £10,667); on distribution, £701; and on management, £1559—the total expenditure being £17,422. The balance carried to the profit and loss account is £7499; and the balance available for distribution is £9003. The Directors recommend the payment of dividends at the rates of 12 and 9 per cent. per annum upon the original and ordinary capital, both subject to income-tax. This will absorb £6555, and leave a balance of £2448 to be carried forward. Under the supervision of Mr. W. Woodward, the Company's Engineer, 12,375 tons of coal and 50 tons of cannel were employed in the production of 125,262,000 cubic feet of gas, of which 116,134,450 cubic feet were sold. The residuals produced were: Coke, 12,425 chaldrons; breeze, 1052 chaldrons; and tar, 125,064 gallons. Sulphate of ammonia to the amount of 114 tons was made; 65 tons of it being sold.

At last Wednesday's meeting of the Salford Town Council, the salary of the Gas Engineer (Mr. W. W. Woodward) was increased by £100 per annum.

PROVINCIAL GAS AND WATER COMPANIES.

Gas Companies.

The annual report of the Airedale Gas Company states that the profit for the year is £2579. The Bradford Corporation have given notice of a Bill to purchase the works; and the Directors have taken the necessary steps for the protection of the Company's interests. The dividends recommended are at the rate of 5 and 3½ per cent. on the different stocks.

At the 94th half-yearly meeting of the Bristol Gas Company, next Thursday, the Directors will report a satisfactory increase in the sale of gas for the six months ending Dec. 31. Notwithstanding the reduction of 1d. per 1000 cubic feet in the price as from the 1st of July, the revenue account shows a balance of profit, after providing for the interest on the debenture stock and the dividend of 5 per cent. on the ordinary stock, of £3124. The accounts accompanying the report show that there was an expenditure of £19,688 on capital account in the past half year; £7589 of it being for new mains and services, and £5928 for new stoves. The total expenditure on capital account up to the close of the year was £1,028,121. The revenue from the sale of gas was £103,103, against £100,549 in the latter half of 1898; residuals produced £37,611, against £31,150; and the total receipts were £144,087, as compared with £134,636. The expenditure on the manufacture of gas was £89,213 (coal, oil, &c., costing £58,607), against £83,105 and £52,361 in the corresponding half of 1898; on distribution, £6922, against £6463; and on management, £5321, against £5298—the total expenses being £111,637, as compared with £104,687. The balance carried to the profit and loss account is £32,450, against £29,949. The sum available for distribution is £49,802.

At the recent half-yearly meeting of the Bury St. Edmunds Gas Company, the Directors reported a considerable increase in the consumption of gas during the past six months. They recommended payment of the usual dividend of 11s. per share on the 1849 capital, 8s. 6d. per share on the 1859 capital, and 8s. per share on the 1879 capital, free of income-tax. The Chairman (Mr. F. C. Andrews), in moving the adoption of the report, remarked that the gratifying aspect of the balance-sheet was largely attributable to the increased consumption of gas, which had been unprecedentedly large. Five out of six steam-engines had made way for gas-engines. The dark days during December had also sent up the consumption. There were 30 prepayment meters in use. The Directors had made a good contract for coal up to next June. The future price of coal, however, would probably determine whether the full dividend would be paid next half year. The Company had really no working capital, but had been spending the savings of past years. The report was adopted.

The half-yearly report of the Directors of the Chester Gas Company (noticed last week) was submitted at the meeting of the shareholders on Wednesday. The Chairman (Mr. John Gamon), in moving its adoption, said that during the past year the gas actually sold had increased by 7,632,000 cubic feet, and brought in an additional revenue of £1052. There had been a considerable extension of mains (4400 yards), which had made this great increase possible. There had been an addition of 31 ordinary consumers; and the cookers, prepayment meters, and gas-fires that had been hired out had exceeded the number of any previous year. Public lamps had decreased by 152. As to the works, there had been formulated a scheme for the improvement of the retort-house, by which they would obtain an increase of 37 per cent. in the manufacturing capacity. The report was adopted; and dividends were declared at the rate of 7 per cent. on the preference stock, 10 per cent. on the ordinary "A" stock, and 7 per cent. on the "B" and ordinary "C" stock.

The annual report of the Clayton, Allerton, and Thornton Gas Company states that the balance of net profit for the past year amounts to £3038. The Directors recommend the payment of a dividend at the rate of 11 per cent. per annum on the original shares and of 5 per cent. per annum on the "A" shares; making, with the interim dividend, 8½ and 7½ per cent. respectively for the year, and leaving a balance of £403.

The annual meeting of the Coatbridge Gas Company was held last Tuesday. The Chairman (Mr. J. Young) made reference to the astonishing rate at which the demand for gas as an illuminant, and for cooking, heating, and motive power, was increasing. During the past few months, he said, they were almost at a loss for means to cope with the requirements of the district; and as the present plant had more than reached its maximum efficiency, large extensions and alterations would necessarily require to be proceeded with at once. The report of the Directors was approved; and dividends at the rates of 10 and 7 per cent. on the old and the new stocks respectively were declared. Mr. T. Wilson, the Engineer of the Company, is to be congratulated upon the success with which he continues to guide the business. As will be seen by our "Notes from Scotland," he has a new enemy to face, in the shape of the Gas-Workers' Union. But he is a man of indomitable will and untiring energy; and, as he has succeeded in baffling the promoters of electric lighting, it may be expected that he will be able to keep his workpeople loyal to their employers, by whom they live.

The half-yearly meeting of the Derby Gas Company was held last Tuesday. The Chairman (Mr. H. Swingler) said that, like other gas companies, they were rather troubled about the supply of coal. In May, when they made their contract, the price was 9s. 7d. per ton; but in October, not because they were short, but to protect themselves and the public from contingencies, the Directors purchased enough coal to last them till next midsummer at 12s. 11d. per ton. This policy had already proved a wise one, as coal was still rising enormously in price, and was more difficult to get delivered. Fortunately, things were not yet bad enough to justify an increase in the price of gas; but unless there was some improvement, such a result might be witnessed in the near future. The report, which the Chairman described as the most satisfactory that had yet been issued, showed an increase in the receipts from the sale of gas of £4278 for the half year, and an increase on the sale of residuals during the same period of £5084. The completion of the extensions of the works had enabled the Company to make 33¼ million feet more gas at an extra cost for labour of only £120. The report was adopted; and the maximum dividend was declared.

The accounts of the Dorchester Gas Company for the six months ending Dec. 31 show that the revenue was £3803, and the expenditure

£2673; leaving £1130 to go to the profit and loss account. The amount available for distribution is £1215; and at the meeting of the Company to-day the Directors will recommend the usual dividends on the ordinary and preference stocks. The quantity of gas sold in the past half year was 474,000 cubic feet in excess of that of the corresponding period of 1898; showing a gradual and satisfactory growth of the Company's business. Incandescent gas lighting has been introduced in the town, and has given general satisfaction.

The report presented by the Directors at the annual meeting of the Durham City Gas Company last Tuesday showed that, including the amount of £368 drawn from the reserve fund, the profit and loss account gave an available balance of £2457, after deducting an interim dividend of £2480. The Directors recommended that a dividend for the past half year of 5 per cent. on the original capital and 3½ per cent. on the additional capital be paid; making a total dividend for the year of 10 and 7 per cent. respectively. In consequence of the advance in the cost of material, the Directors stated that they had been obliged to advance the price of gas 3d. per 1000 cubic feet, subject to the present discount. The revenue account showed a total expenditure of £10,161, and an income of £15,629. The report was adopted.

The Directors of the Elland-cum-Greetland Gas Company report that during the past year the expenditure on capital account was £709; this sum having been spent upon new mains and new prepayment meters. The profits, including the balance brought forward, amount to £6032. An interim dividend at the rate of 12s. per share was paid for the June half year, absorbing, with the prescribed dividends on the preference shares and interest on the loan capital for the year, £2632; leaving a balance of £3400 available for distribution. The Directors recommend that out of this sum a dividend of 14s. per share upon the ordinary capital be declared for the December half; making 13 per cent. for the year.

At the meeting of the Epping Gas Company, Limited, on Monday, the 5th inst., the Directors presented the 35th annual report. The accounts accompanying it showed that the revenue from the sale of gas last year was £1639, against £1523 for 1898; and that the total receipts amounted to £2183, as compared with £1965. The expenditure was £1487, against £1451; and the balance £696, against £513. A dividend at the rate of 5 per cent. per annum was declared, with a bonus of 2 per cent. The Company was formed with a capital of £4500, in £10 shares. In 1871, 100 new shares were issued; bringing up the capital to £5500. In 1874-5, with gas at 7s. 6d. per 1000 cubic feet, there was no dividend, and the Company had a loan of £900. In 1880, this was all paid off; and in the following year a sum of £200 was set aside as a reserve. In 1895, the reserve amounted to £900; and from that year down to the present time more than £2500 has been spent on the works, in the erection of a holder to contain 100,000 cubic feet of gas, together with a new retort house and scrubbers. The result is that the works are now in first rate condition. The price has been brought down to 4s. 2d. per 1000 cubic feet; everything has been paid for; and the Directors hope to revive the reserve fund. The capital remains the same—£5500.

The Grantham Gas Company met last Tuesday, with Dr. J. W. Jeans in the chair. Dividends at the rate of 10 and 7 per cent. per annum on the old and new shares respectively were declared. A special meeting was afterwards held to consider the promotion of a Bill in Parliament for further powers. It was stated by Mr. J. G. Thompson that the Company had a consumption of over 90 million cubic feet of gas a year; and during the last three years, it had increased 30 per cent. If the Bill came into operation, the Company not only hoped to keep up their dividends, but to decrease the price, if possible, from 2s. 11d. to 2s. 6d. per 1000 cubic feet. They proposed to ask for a further sum of £45,000; and they wished to alter the nature of the shares. The holder of a £20 share paying 10 per cent. would have 40 shares of £1 each, with a maximum payment of 5 per cent. dividend, and the holder of a £20 share, paying 7 per cent., would have 28 shares of £1 each, with a maximum of 5 per cent. dividend. It was also proposed to issue the £45,000 in £1 shares. The extension of the operations of the Company to Great Gonerby and Barrowby was contemplated. A resolution approving of the Bill was passed.

Some extensive alterations have been made at the works of the Launceston Gas Company; and the Directors have purchased some adjoining property with the view to improving the approach to the premises. The capital has also been increased by the issue, to the existing shareholders, of 300 shares at £2 premium. The profit for the year was £605; and a dividend of 7s. per share has been paid.

The Longwood Gas Company netted a good increase in consumption last year—14·1 per cent. The Directors recommend dividends of 5 per cent. on the original shares and 3½ per cent. on the new ordinary stock, which, with the interim dividend, makes 7½ and 5¼ per cent. for the year respectively.

The report of the Malton Gas Company for the half year ending Dec. 31 shows that the results are satisfactory. The sale of gas continues to increase; the quantity sold for private consumption being 1,400,000 cubic feet more than in the corresponding half of 1898. The balance of the revenue account is £1852; and the amount available for distribution, after adding the balance brought forward and paying the interest on the mortgages, is £2942. The Directors recommend the payment of a dividend at the rate of 5½ per cent. per annum, free of income-tax. They propose to extend the use of Welsbach incandescent gas-lights.

The accounts for the six months ending Dec. 31 last, which were presented at the meeting of the Town and County of Poole Gas Company yesterday, showed that the revenue amounted to £4499, and the expenditure to £3102; leaving a balance of £1397, as compared with £1383 this time last year. The amount available for distribution was £7063; and the Directors recommended the payment of the maximum dividends. The prosperity of the Company has been maintained; the increase in the sale of gas for the past year being nearly 7 per cent.

Last Thursday, Mr. T. Winch presided over the half-yearly meeting of the Rochester, Chatham, &c., Gas Company. The report, which was adopted, showed a total revenue for the half year of £33,886, on which the profit amounted to £3067. The usual maximum dividends of 10 per cent. on the "A" and "D" shares, and 7 per cent. on the "B" and "C" shares, were declared.

The half-yearly report of the Scarborough Gas Company states that the net revenue, including £374 brought from the last account, and after deducting all interest charges for the half year, is £7764. The Directors recommend the payment of the maximum dividends upon all the stock, less income-tax. The payment of these will leave a balance of £1665 to be carried forward. Fifty mortgages of £100 each, bearing interest at the rate of 3¼ per cent., and new ordinary 5 per cent. stock to the amount of £6280, were allotted during the six months.

The annual meeting of the Shanklin Gas Company was held last Wednesday—Mr. F. Cooper, the Chairman of the Company, presiding. The report of the Directors showed that, as the result of the year's work, they had £2268 for division; and dividends were declared of 9 per cent. on the original, and £6 6s. per cent. on the new ordinary shares.

The receipts of the Sleaford Gas Company for gas supplied during the past year amounted to £3437, and the entire revenue to £5878. The expenditure being £5031, the balance carried to the profit and loss account is £847. The amount available for distribution is £3482; and at the meeting of the Company to-day, the Directors will recommend a dividend at the rate of 7½ per cent. per annum, free of income-tax. Under the supervision of Mr. H. Wimhurst, 1974 tons of coal were carbonized last year; the quantity of gas sold to private consumers being 18,930,600 cubic feet, and for public lighting and under contracts 1,211,900 cubic feet. The Directors report a steady increase in consumption; and the number of prepayment meters now in use is nearly 400.

In moving the adoption of the report—noticed last week—at the meeting of the York Gas Company on Thursday, the Chairman (Mr. J. R. Hill) remarked that, so far as the Directors could see, there was not the slightest need for gas shareholders to feel nervous about the future, either on account of the price of coal or because of competition with the electric light. There was not an instance in the country where the electric light had prejudicially affected the dividends of gas undertakings. The continued growth of the Company's business, however, implied the necessity of keeping the plant abreast of the demand which the future had evidently in store. The report was adopted.

Water Companies.

The half-yearly meeting of the Brompton, Chatham, &c., Water Company was held last Thursday, under the presidency of Mr. J. Baird. The maximum dividends at the rates of 10 and 7 per cent. on the "A" and "B" shares were declared. The issue of 2000 £5 new ordinary shares was authorized during the half year. The capital account has been raised by the issue of 1500 new "B" shares, which, with the 500 shares sold by auction on the 23rd ult., realized a total sum of £20,000.

The shareholders of the Chester Water Company met on Thursday, and were informed that the accounts for the half year showed a surplus of revenue over expenditure of £2989, giving a total disposable balance of £10,564. The interest on preference capital required £450; leaving in hand £10,114. It was recommended that the statutory dividends be paid (free of income-tax), which would absorb £1890, and leave £8224. The Chairman (Mr. W. Brown) observed that it was very satisfactory to notice that the opinion which was once entertained in regard to the water had now disappeared. Nearly a mile of fresh pipes had been laid; and the result was that the income from rates had not fallen, although they had taken nearly £700 off the charges for baths. The report was adopted.

The East Worcestershire Water Company during the past half year have raised their total connections (excluding Droitwich and Rednal) to 5357. The average daily consumption of water in the same period was 825,822 gallons; being largely in excess of any previous half year. Progress is being made with additional works; and new extensions foreshadowed are estimated to cost £15,000. To meet capital outlay, the shareholders are to be invited to take up further shares and stock. The accounts exhibit a total disposable amount of £2692, from which it is proposed to pay a dividend at the rate of 4 per cent. per annum.

The Grantham Water Company had a balance on the past half-year's revenue account of £7294; and at the meeting last Tuesday, it was agreed to pay a dividend at the rate of 10 per cent. per annum. The balance to be carried forward will be £5544.

A satisfactory increase in revenue is shown by the annual report of the Southport Water Company; the total income from water-rents, &c., being £37,300. An interim dividend at the rate of 9 per cent. on the original and "A" shares and 7 per cent. on the remainder of the paid-up capital of the Company was paid; and the Directors now recommend the payment of dividends at the same rates for the second half of the year.

In the report of the Directors which will be submitted to the proprietors of the South Staffordshire Water Company at the meeting to be held on the 22nd inst., they state that the number of houses laid on during the half year ending Dec. 31 was 2483; making the total supplied 103,965. The gross amount of water-rates for the half year was £54,228, against £51,095 in the corresponding period of the previous year. After providing for interest on the debenture and preference stocks, the amount left for division (including £8687 brought forward) is £27,573; and the Directors recommend the declaration of a dividend for the half year on the ordinary stock at the rate of 6 per cent. per annum, free of income-tax. The amount of this dividend being £17,850, there will remain £9722 to the good. The report of the Engineer (Mr. H. Ashton Hill, M.Inst.C.E.) as to the condition of the Company's works shows that they are in substantial order and repair.

At the half-yearly meeting of the Truro Water Company last Thursday, the Chairman made some comments on the progress of the undertaking. In 1893 the revenue amounted to £1355, the net balance of profit was £790, and the dividend was 2½ per cent. Last year the revenue amounted to £2351, the net profit to £1158, and the Directors proposed to pay a dividend of 5 per cent. In reality, they could pay 7½ per cent. if they had not thought it wise to transfer various sums to the capital account. The concern was therefore in a very progressive state. With reference to the negotiations with the Town Council for the purchase of the undertaking, the Chairman explained that an offer had been made by the Corporation which the Directors considered totally inadequate. They had informed the Council of this opinion, and there the matter rested. The report was adopted, and a dividend of 5 per cent. declared.

The Whitby Water Company's half-yearly report shows a disposable balance of £1974; and at the meeting last Tuesday, dividends were declared at the rate of 3½ per cent. on the preference stock, 8s. 6d. per share on the original shares (being equal to 8½ per cent.), and 5s. 11½d. per share on the new 1897 shares (being equal to £5 19s. per cent. per annum). These payments leave £795 to be carried forward.

MANCHESTER GAS AND WATER SUPPLY.

The New Gas Engineer—Electrolysis and Its Effect on the Water-Mains.

At the Monthly Meeting of the Manchester City Council, on Wednesday last, one or two important recommendations in connection with the Gas and Water Departments came up for consideration.

Alderman GIBSON moved the adoption of the Gas Committee's minutes, which included a recommendation that Mr. John Gibson Newbigging, Assoc.M.Inst.C.E., be appointed Engineer to the Department at a salary of £800 per annum.

Mr. HODGE observed that at the last meeting of the Council the Chairman of the Gas Committee passed a high eulogium upon the late Mr. Stevenson. If Mr. Stevenson was worthy of all Alderman Gibson had said of him, it seemed a strange thing that the Gas Committee should appoint as his successor a man with less experience and knowledge at a greater salary. He thought an explanation was due from the Chairman with respect to the appointment. To his mind, it was a case of the Chairman of the Gas Committee coming before the Council and asking them to shut their eyes, open their mouths, and swallow all.

Alderman GIBSON: There is no reply to make to a statement of that kind; and I must tell my friend, and every other member of this Council, that when he expects any reply from me he must treat me as a gentleman. If Mr. Hodge had asked the question as he should have done, without unfair and ungentlemanly criticism, I would have told him why we have adopted the recommendation. As it is, I will not.

Mr. SUTTON said the question was whether the Chairman could give the Council any reason why another £100 a year should have been put on the new Engineer's salary. It seemed to him rather strange that the new man should have £800, while the late Manager should only have had £700. He should like to know the reason for the change.

The LORD MAYOR said he could answer that question. Prior to Mr. Stevenson's death, he did not think that gentleman was at all satisfied with his position; and had he lived, no doubt his salary would have been advanced. The new Engineer came with very high credentials. He was selected out of a good number as the best man; and in view of the large amount of engineering work in front of him, which he would be quite capable of doing, they had agreed to increase the salary. He would earn a great deal of it in this extra engineering work—in getting out plans, specifications, &c.; and if this were paid upon percentage, they would have had to give any other engineer a great portion of the salary in that way. Under these conditions, they had got the best man they could for the position, and had, of course, to pay a good salary.

Mr. HAMPSON, who is a member of the Gas Committee, said he did not think the strictures made by Alderman Gibson on Mr. Hodge were at all justified. Personally, he failed to see anything of a discourteous nature in Mr. Hodge's remarks. He joined with him in protesting against starting the new Engineer at £800 a year. He was a young man of 38, who had never earned more than £300 a year before; and it was a reflection on the dead Manager to start the new comer with £100 a year more than they paid the man who had perished in his labours, and who had been with them for a considerable number of years.

Mr. BROCKLEHURST asked whether the advertisement stated that the salary would be £800 a year.

The LORD MAYOR answered in the affirmative.

Dr. BISHOP thought that the appointment of a new servant of the Corporation at a salary of £800 was a most fitting time for the Chairman to give some little explanation of the position of his Committee on the matter.

Alderman GIBSON said several members of the Committee did not think £800 at all sufficient. He himself, like Mr. Hampson, would not agree to anything more than £800. The fact that Mr. Stevenson did not get £800 was his own fault entirely. He might, and would, have had it if he had gone the right way about it. Had Mr. Stevenson lived, he did not doubt that he (Alderman Gibson) would have asked for an advance of £200 a year for him. The salary of £800 a year had been decided on by a large majority of the Committee, and brought before, and approved by, the Council. The vacancy was advertised in accordance with that decision; and there was now no question as to the salary, but only of the fitness of the man for the position.

The minutes of the Gas Committee, including the appointment of Mr. Newbigging, were then adopted.

Sir J. J. HARWOOD, in moving the adoption of the proceedings of the Water-Works Committee, referred to a report which had been issued to members of the Council respecting the injury caused to the water-mains by electrolytic action. In this report, which had been supplied by Mr. Haynes, General Inspector and Surveyor of Mains, and Mr. L. Holme Lewis, Engineer and Manager of the hydraulic power supply, the former gentleman stated that in many cases of burst lead service-pipes that had occurred recently it had been found on examination that they had been damaged by electrolytic action, caused by the current escaping from the electric cables laid underground. The effect of this was to pit the pipe; thus reducing its strength to resist the pressure of water. With regard to iron mains, it was asserted that the result might be still more serious—especially as the extension of the electric supply for the purposes of traction would be worked at considerably higher tension than the present system. No one, Sir John remarked, could give an absolute statement as to the damage caused to pipes by electrolytic action; but there was no doubt as to the risk involved, and the Water Committee accordingly suggested that the Chairman of the Technical Instruction Committee be respectfully requested to afford at the Technical School such facilities as might be considered necessary in order to make a full investigation into this important matter. Referring to the recommendation of the Committee to increase the water supply from Longendale, he observed that in times of heavy rain much water ran to waste, because more could not be conveyed than 25,000 gallons per day; and it was now proposed to put in a 40-inch main to increase the supply, which could be done at a cost of £25,000.

The motion was seconded by Sir B. T. LEECH.

Alderman HIGGINBOTTOM, Chairman of the Electricity Committee, said his Committee were wishful to avoid damage to Corporation property. They were working under Board of Trade regulations, which were most stringent, and had been compiled by the greatest electrical experts with a view to prevent electrolysis. He asked the Council not to adopt the report as issued, because it was not correct in many of its statements. There had been, he admitted, a few cases of lead water service-pipes that had been damaged when the first electric installation was laid down, but with the new kind of electric service cable that was instituted several years back, there was no possibility of leakage. He also denied that there would be any damage to iron mains from the institution of higher voltage for electric traction and electrical extensions at higher tension. His Committee did not deny that damage could be done to mains if certain conditions existed. But those conditions did not exist to-day; and the regulations of the Board of Trade, and the special safeguards that were adopted, were such as to prevent them being set up. His Committee had no objection to an inquiry; but it should be a proper one. It should be carried out by electrical experts in consultation with the Committees affected, and then the result could be presented to the Council as a joint report.

Alderman HOY suggested that the report under discussion be referred to the Technical Instruction Committee.

Sir B. T. LEECH said he could show iron pipes pitted over with soft places; and as these were in proximity to electric mains, they believed it was the electricity that affected them. There were so many gas and water pipes in the city that it was only fair to the Gas and Water Committees that some protection should be afforded against anything that might injuriously affect them.

Mr. LAMBERT said if the Chairmen and Deputy-Chairmen of the Water, Electricity, Tramways, and Gas Committees had been put to consider the matter, they would have arrived at some resolution which would have obviated the needless alarm that had been raised.

Mr. WILSON remarked that he never knew a cable yet which would not leak; and in this matter they had to consider the bad and scamped work sometimes put in when the cables were laid in the ground. He supported the Water Committee in their recommendation for an immediate inquiry on the question of electrolysis.

Alderman GIBSON said they were indebted to Sir John Harwood for having brought the matter into the light of day. They should have the very best scientific and expert evidence which the country could produce, in order to satisfy the Council and the city on this very important subject. He thought, however, it would have been better if Sir John Harwood had consulted with the Gas, Electricity, and Tramways Committees before bringing forward his resolution, because it affected all the Committees mentioned.

Mr. BOYLE pointed out that the water-mains, gas-mains, tram-rails, electric cables, &c., were all the property of the Council; and the question was simply that of considering the effect of one part of their property upon another.

Alderman RICHARDS remarked that failures in the electric light were so frequent that people were plunged in darkness on an average once a week. Only recently a son of his had been carried 6 feet off the ground by the force of an explosion. There was waste in water, gas, and electric current that could not be avoided. It was no great affair for the Water Committee to seek further information on the question of electrolysis.

Mr. DREYFUS observed that the city was honeycombed with gas-pipes, water-pipes, hydraulic pipes, telephone wires, and electric cables; and the streets were constantly "up," which interfered greatly with traffic. The manner of laying pipes was most primitive, if not barbaric. The time had come to consider whether tunnels ought not to be laid under the footways, where the pipes could be placed, preserved, and easily "got at" without interfering with traffic. He suggested that if a Committee were appointed this matter also should be laid before the experts.

Sir J. HARWOOD said neither the Board of Trade nor any other power could prevent the electric current running to earth in some degree. The Electricity Committee might take all possible precautions; but when they had done their best, there was a power they could not control. The report was simply one asking the Council to be good enough to institute an inquiry. They wanted information; and wherever it came from the Water Committee would be very glad to have it. They would have been neglecting their duty if they had not taken the course they had, in view of the damage done. He did not think a report coming from the Electricity Committee would have had the same reception by the public as one coming from the representatives of the Water Department.

Alderman HIGGINBOTTOM said it was the publishing of the present report that he objected to.

Sir J. HARWOOD: Very well then, do not publish it. The Committee have no feeling whatever on the point.

Alderman SOUTHERN thought if the report was withdrawn, something should be put in its place. He moved that the Chairmen and Deputy-Chairmen of the various Committees concerned should meet together and appoint such experts as they thought fit to make the investigations, and present to the Council a definite report on the question.

Alderman GRIFFIN seconded the motion, which was accepted by Sir John Harwood, and approved of by the Council.

Ottoman Gas Company, Limited.—The Directors of this Company, at the half-yearly meeting next Thursday, will report that the gas-rental for the six months ending Dec. 31 last amounted to £10,487 (for the corresponding period of 1898 it was £10,264), and that the net profit is £2875. The amount standing to the credit of the profit and loss account is £3336; and the Directors recommend a dividend at the rate of 7 per cent. per annum on both classes of shares, amounting to £2625, leaving a balance of £711 to be carried forward.

Gas-Meter Testing and Public Lighting at Bristol.—In a report issued by Mr. Benjamin Kitt, the Gas Examiner of Bristol, it is stated that the number of meters tested by his Department during the past year was 1587. The total number tested since the commencement of the Gas Act amounts to 44,124. The number of certificates issued was 12,627; and up to the present time £1453 has been received as fees. The total number of public lamps amounts to 7591; being 5844 in the old area and 1747 in the extended area. The total number of new lamps erected during the year was 255. The total number of gas-lamps discontinued in all the districts now lighted by electricity is 599; and the total number of electric lamps installed is 306. The total consumption of gas for public purposes in the year was 163,602,126 cubic feet. Compared with the previous year, this is a decrease of 7,469,374 feet, and is principally due to the extension of the electric light in areas formerly lighted by gas.

THE POWERS OF THE MASSACHUSETTS (U.S.A.) GAS COMMISSIONERS.

A Gas Company Ordered to Reduce their Price.

A correspondent has forwarded a cutting from the "Boston Daily Advertiser" of the 24th ult., containing a report of a decision given by the Gas Commissioners of Massachusetts in an application by the citizens of Haverhill for a reduction of the price charged for gas. The circumstances which gave rise to the application will be understood from the following particulars extracted from the Commissioners' judgment.

The Haverhill Gaslight Company was organized under a special Charter in February, 1853, with a capital which was originally $45,000, subsequently increased in 1871 to $75,000. In addition to the payment of an average dividend of about 8 per cent., they have accumulated a surplus, invested in the plant, estimated to represent $275,000. The Commissioners say it is probable that a part of this will disappear in the near future through the abandonment of existing plant in making improvements which are likely to prove necessary for properly supplying the public; but the surplus is much larger than can be utilized for any such purpose. This accumulation appears to have been due in part to exceptional care in the management, and in part to a rapid gain in wealth and population in the community supplied. Its growth has been steady through a long series of years, and not excessive in any single year. Its existence thus appears to be due to a certain extent to causes over which the Company have had no control, and for which they are entitled to no particular credit. Accumulated as it has been out of profits in the performance of a public service, its existence affords exceptional facilities and imposes peculiar duties upon the corporation towards the public. As the Company have applied this surplus in improving and enlarging their plant as needed to satisfy the public demand, the property in which it has been invested must otherwise have been represented by new capital contributed by the shareholders.

This use of the surplus, the Commissioners allow, may properly be made of substantial benefit to the consumers and shareholders alike; and, by every principle of law, is the property of the corporation. They have an undoubted legal right to distribute it as a dividend as it is acquired, or *pro ratâ* to the shareholders in case of liquidation. But, notwithstanding this, the circumstances attending its accumulation impose upon the Company, so long as they continue to exercise the functions of a public monopoly, the duty to employ it for the joint advantage of the consumers and the corporation. It need not be dealt with as the exclusive property of either.

The Commissioners say that fortunately, in the majority of Companies of this class in Massachusetts, the recognition of this duty by the Directors has been a part of the policy of their management; and until recently it was the policy also of the Company in Haverhill. Now, however, this policy appears to have undergone a very decided change. They then explain the nature of this change.

In July, 1899, the Haverhill Gas Securities Company was chartered under the laws of this Commonwealth with a capital of $500,000, and with the avowed purpose "to transact a general brokerage business, and to purchase, hold, sell, assign, transfer, mortgage, pledge, or otherwise dispose of, the shares of capital stock of, or any bonds, securities, or evidence of indebtedness created by, any other corporation or corporations of the Commonwealth of Massachusetts, and while owner of such shares of stock to exercise the rights, powers, and privileges of ownership." Subsequent events seem to indicate that in these words its real purpose was adroitly concealed. Its promoters and principal incorporators had already completed negotiations for the purchase of all the outstanding stock of the Haverhill Gaslight Company, the par value of which was $75,000, and agreed to pay therefor substantially the entire capital of the Securities Company. Either with this stock or the cash collected for purchase, in order to complete a perfunctory compliance with the laws, the entire capital of the Securities Company was paid in. It then proceeded to issue and sell 5 per cent. debentures for the full amount of the $500,000 with the entire stock of the Gas Company deposited with a trustee as collateral security therefor; leaving to the promoters as their profit on the transaction the entire capital stock of the Securities Company and the control of the Gaslight Company.

We have been unable to learn that the Securities Company possesses or expects to acquire any other property or source of income in addition to the equity in the Haverhill Gaslight Company's stock and the returns from its business.

In 1868, the Legislature passed the following Act, which is now a part of the Public Statutes: "No railroad corporation, telegraph or gaslight company, chartered under the laws of this Commonwealth, shall hereafter declare any stock dividend or divide the proceeds of the sale of stock among its shareholders."

This is not merely a prohibition against stock watering, but against the division of a surplus into new capital stock. The principle announced in this statute is not to be defeated by any shrewdly contrived method of stock manipulation.

The obvious purpose and tendency of the Securities Company is to evade and annul the policy which this statute declares. It is indirectly, but distinctly, an effort to capitalize the Company's surplus. To pay interest upon the new bonds will annually require a sum greater by more than 60 per cent. than the highest regular dividends ever paid by the Gas Company.

The existence of this burden is a virtual declaration of a purpose in the Securities Company practically to take out of the Gaslight Company, directly or indirectly, sooner or later, that portion of the profits which the management has been accustomed to reserve within the corporation for the joint benefit of the Company and its consumers. It has already taken, by a single act, the sum of $20,000, which it claims was in anticipation of a dividend not yet earned.

In view of these facts, there is no reason to believe that the former policy of the Company in the treatment of profits will be continued, but there is ample reason to assume that it will turn over to the Gas Securities Company until its needs are satisfied whatever provision for contingencies may be allowed in the price. To such a policy consumers ought not to be asked to contribute. The Board, therefore, recommend that the net price to be charged for gas supplied by the Company from and after Feb. 1, 1900, shall not exceed 80c. per 1000 cubic feet.

A METER-RENT QUESTION AT MELTHAM.

A lively discussion, which towards the close led to personalities, took place at the monthly meeting of the Meltham District Council on Monday last week. The minutes of the Gas and Lighting Committee contained a recommendation "that the payment of meter-rents be re-established on the same basis as formerly." Mr. Mellor, in moving the adoption of the minutes, explained the reason for including the recommendation therein. He said the matter had been considered by the Council in the past, and in some quarters it was regarded as a mistake when it was decided to abolish meter-rents. Owing to the financial state of the Gas Department, the question had become a serious one. As they were all aware, wages had been advanced two or three times within the last three or four years; but the charge for gas supplied by the Council had remained unaltered, although other gas manufacturers had put up the price owing to the increased cost of production. At the time they decided to abolish meter-rents there was an alternative proposal—of which he believed he was the mover—that the price of gas should be reduced to the extent of 5d. per 1000 cubic feet. A number of people were burning gas as a kind of luxury—he meant to say that they were only using it on special occasions—because they had no meter-rent to pay; and people who used large quantities had to make up for these small and occasional consumers. Mr. Brook seconded the motion. Mr. Preston said he thought the proposal was one of the most retrograde the Council had ever to his knowledge had to consider. What was the reason for the abolition of the meter-rents? At the time it was found that a large number of consumers wanted a reduction in the price of gas; but the majority of the Council decided in favour of the abolition of meter-rents. There were between fifty and sixty consumers who were using less than 2000 cubic feet of gas a year; and when the matter was before the Council last time, Mr. Mellor practically suggested the disfranchisement of these people. The reimposition of the meter-rents would only make a difference in the receipts of the Gas Department of about £70 per annum; but since the rent was abolished, the profit for the concern had been larger. As to the argument that the price of coals had gone up, what difference would it make to them, when they had their coal under a twelve months' contract, five months of which were still to run out? If it was a question of the financial position of the Gas Department, they should put up the price of gas, and he would support them. He moved that the minute be referred back to the Gas Committee. Mr. Brook could not see that the minute contained a retrograde proposal. He thought it was wrong to abolish meter-rents, because the abolition of capital values was invariably wrong in principle, for capital should always pay interest, which should be the first charge in any concern after the working expenses had been completed. Twelve months ago they had a number of meters out that were earning nothing; and capital was thus lying dead. He appealed to the Council to consider the question from a practical, businesslike point of view. Mr. Manchester said he would have supported the amendment if Mr. Preston had proposed that the matter be referred to the General Purposes Committee. Mr. Preston expressed his willingness to refer it to them; whereupon the amendment was altered to this effect. Mr. Mellor then replied. He said the question had been discussed and re-discussed by the Gas Committee for several years, and he did not see that there would be any advantage gained by referring it back to the Committee. He would like the Council to settle the matter at this meeting. Eventually the amendment was declared carried. Thereupon Mr. Mellor tendered his resignation of the chairmanship of the Committee.

LEEDS CORPORATION GAS UNDERTAKING.

Increase in the Salary of the General Manager.

In the "JOURNAL" last week it was stated that a proposition was to be submitted to the Leeds City Council by the Gas Committee, that the salary of the General Manager of the Gas Department (Mr. R. H. Townsley) should be raised by £200 per annum. Mr. Townsley has been in the service of the Corporation since 1878; and about twelve years ago he was appointed Manager of the York Street works. Early in 1895, he was promoted to the position of Superintendent of the Gas Department, in succession to Mr. Lupton, who had died in the previous November. At that time, hand stoking was the only system in use. But since then very large extensions and improvements have been carried out at all the stations, notably the installation of stoking machinery at New Wortley, and a reconstruction of the works generally; also the inclined retort installation at the Meadow Lane works, a new purifier-house, and a general extension of the auxiliary plant. At the York Street works the whole of the mains have been relaid; and coal-stores have been built at all the works. In addition to these alterations, very considerable extentions and enlargement of the mains in the city have taken place. The quantity of gas made in the year ending June 30, 1895, was 2,586,102,800 cubic feet; whereas the make in the twelve months ended June last was 3,016,979,254 cubic feet – an increase of 430,876,454 cubic feet, or 16·6 per cent. The carbonizing wages in the first-named year, with hand work, were at the rate of 3s. 3¼d. per ton of coal; last year, with stoking machinery and inclined retorts in use, they were 2s. 0½d. The quantity of gas sold per ton of coal used in the past year was greater by 324 cubic feet than it was in the twelve months ending June 30, 1895; and it is the highest sale figure ever reached in the history of the gas undertaking. While the improvements carried out under Mr. Townsley's supervision, which have involved an expenditure of no less than £150,000, have resulted in increased profits for the gas undertaking, they have also, and necessarily, entailed a progressive increase in his ordinary duties, and added largely to his responsibilities. These facts were duly considered by the Gas Committee, in conjunction with the annual make of gas and the salaries paid to Gas Engineers in other large towns; and the result was a unanimous decision to recommend an increase in Mr. Townsley's remuneration by the above-named sum. The proposition was brought before the Council, at their meeting last Wednesday, by Alderman Lowden, the Chairman of the Committee, who alluded in favourable terms to the work of the General Manager, against whom, he added, there had never been the slightest complaint; and it was agreed to without a single question being asked or a dissentient vote recorded.

A COMPARISON OF THE COST OF INCANDESCENT GAS AND ELECTRIC LIGHTING.

Facts are Stubborn Things.

The following is a letter, signed "An Old Inhabitant," which appeared in the "Belfast News-Letter" last Thursday. The writer's simply-worded but pointed statement needs no comment.

"In the spring of last year, the writer, a retailer in the centre of the city, removed into new premises. With an outlay of between £40 and £50, I had my new premises fitted with the most approved electric lamps, consisting of 28 incandescent lamps of 8, 16, and 32 candle power, also two arc lamps. My old establishment was lit by 24 ordinary (Welsbach) incandescent gas-burners, and two large Wenham lamps. When I decided to adopt the electric light for my new premises, the firm who estimated for fitting up, very considerately told me that my account for lighting would be about double my usual gas account. The following has been the result: My gas account for *six* months, July to end of December, 1898, amounted to £1 17s. 9d. (in these winter months the lights were kept going much longer for heating purposes than the corresponding months when using electric light), my electric account for *three* months ending January 8, 1900, amounted to £16, including 3s. meter-rent. There are two points which I wish could be brought under consideration, and, if possible, revision in the proper quarter. Firstly, the rating at which the consumer is charged '7d. per unit for first hour's use' of the consumer's maximum demand per day (for 182 days each half year), and 2d. per unit for all used afterwards. According to this rate, I believe that in the six months (observe three autumn and three winter months, or three spring and three summer months) my account would have to total at least £20 before I could obtain the advantage of the 2d. per unit rate. In my case, which must be the case of many others, I am powerless to obtain any advantage of the reduced rate, as my business day closes at six o'clock each evening, and on Saturdays at three o'clock. This brings me to my second point—namely, the clause 'for 182 days each half year.' This applies only to those consumers who keep their business places open, and necessarily their assistants confined, until six, eight, or eleven o'clock each day from Monday till Saturday night. The electric light has great advantages in convenience of lighting up each evening, and also from the standpoint of health; but as far as brilliance is concerned, I honestly believe that I had as good results proportionately for the number of lights, with an expenditure of 37s. 9d. for gas—my six months' account—as for 320s. for electric supply, my three months' account."

ELECTRIC LIGHTING NOTES.

The Finance and General Purposes Committee of the Heywood Town Council have approved of a scheme of electric lighting submitted by Mr. W. P. Adams, of London; and they recommend the Corporation to apply for the necessary borrowing powers.

Alderman Hind, the Chairman of the Electricity Committee of the Stockton Corporation, calculates that the cost of electricity is about one-and-a-half times that of gas. It is hoped that the works for the supply of electricity will be ready for business next August.

It was reported at the meeting of the Electric Lighting Committee of the Middlesbrough Corporation that the total demand from 88 applicants for the light was equal to 4525 8-candle power lamps. The capacity of the installation is 6666 lights, so that the demand is considered so far satisfactory.

It was reported to the Hereford Town Council last Tuesday that the number of 8-candle power lamps connected with the electricity system was now 2283, 1413 lights were ready for connection, and a further 1252 would, it was thought, be added before the end of the current half year. It was also stated that the estimated cost of the works—£20,000—had not been exceeded.

Failing at the present time to secure the approval of the ratepayers to a scheme of electric lighting, the Great Malvern District Council have resolved to ask the Board of Trade to extend their Provisional Order for a further term of three years, or failing this, to allow the Council to transfer the Order to a company on the best terms obtainable. Two Companies have offered to treat for the supply of the town.

The Leeds City Council last Wednesday authorized the Lighting Committee to proceed with the development of the Britannia Mills site for an electricity station, by the erection of buildings thereon, and the provision of the machinery necessary for the supply of current on the two-phase system at 50 alternations, in accordance with the recommendation contained in a report by Messrs. Hopkinson and Talbot.

The Newcastle Corporation are going to make an effort to have the city excluded from the Bill of the Tyneside Electric Power Company. There are already two Companies supplying the city; and the Council are thinking of having a supply of electrical power on their own account. With a new comer, the streets would be over-run with cables. Strenuous opposition is also to be offered to the Tyneside Bill by Gateshead and Tynemouth.

For eighteen years the question of electric lighting has been under discussion by the Birkdale District Council. Our authority for saying this is Mr. Clinning, a member of the Council. The end of this lengthened and, we suppose, profound consideration was witnessed last Tuesday, when the Council assented to the affixing of their seal to an agreement with the British Electric Traction Company, by which the electric lighting powers obtained by the Council were handed over.

In his report to the Fire Brigade Committee of the London County Council, the Chief Officer of the Metropolitan Fire Brigade (Commander Wells) states that nine fires occurred last year on the premises of electricians—five being caused by short-circuiting of electric wires, one by overheating of the boiler, one by hot ashes, and the causes of two were unknown. There were ten fires at electric lighting works, caused as follows: Overheating of boiler, 1; short-circuiting of electric wires, 5; spark from fire, 1; spontaneous ignition, 3. Of the 3846 fires in London during the year, 18 were attributed to short-circuiting.

A Local Government Board inquiry was held at Blackpool on Tuesday last with reference to the application of the Corporation to borrow £42,515 for electric lighting. Colonel Luard was the Inspector, and to him the Town Clerk explained that this was the fifth application for sanction to borrow money for the electricity undertaking; and since 1893 £120,000 had been borrowed. The consumers had increased from 112 to 900. It was absolutely necessary, with a view to meeting the increasing demands and providing for the trams, that the works should be extended. There was no opposition, and the Inspector intimated that he would report favourably to the Board.

The Sevenoaks District Council have been dilly-dallying with the electric lighting question for a long while; and now they have practically arrived, by roundabout procedure, at the position they were in at the start. They have withdrawn their petition to the Board of Trade for a Provisional Order, and assented to an application by the Electrical Power Distribution Company. Of course, clauses are to be inserted in the Company's Order giving the Council certain rights in connection with the purchase of the undertaking; but what the Company have now conceded could no doubt have been obtained from them, or some other company, long since by the application of a little pressure.

At the quarterly meeting of the Oswestry Town Council on Monday last week, the Town Clerk (Mr. J. Parry-Jones) reported that the Local Government Board had written to say they had received the report made by their Inspector (Mr. Bicknell) after the inquiry held by him with reference to the application of the Council for sanction to borrow £18,000 for the purchase of the undertaking of the Oswestry Electric Light and Power Company, Limited, had carefully considered it, with the evidence submitted at the inquiry, and had come to the conclusion that they could not sanction the proposed loan. The announcement was received with applause; whereupon the ex-Mayor (Mr. W. A. Aylmer-Lewis) remarked that the decision put Oswestry back twenty years.

A conference was held at Cardiff last Wednesday, in response to a circular sent out in the joint names of the Town Clerks of Cardiff, Newport, and Swansea, of all the local bodies affected by the Bill which is being promoted in the present session of Parliament by the South Wales Electrical Power Distributing Company. The opinion of the meeting was that the Bill should be vigorously opposed on second reading. To give effect to this, it was agreed to prepare petitions, and to forward them to all the local authorities concerned for their adoption. The parliamentary representatives are also to be asked to support the opposition to the measure, as well as to the other Electrical Power Bills which are being promoted. If the opposition is unsuccessful on the second reading, it will be continued in the further stages of the Bill.

Exeter is again complaining of the eccentricities of the electric light. According to one of the local papers, the light has "no consistency of quality," being now low, then lower, then brightening up splendidly only to die down again, and rarely giving satisfactory illumination. As a means of ascertaining whether consumers are getting value for their money, and if not why not, it is suggested that independent reports should be made of the electric light as they are of the illuminating power of the gas. As to the arc lamps in the streets, the Electric Lighting Committee are recommended to look after what is described as the "jumping-Jenny" performances of their pets. The lamps do seem to be a little troublesome. Sometimes arc lamps and the side incandescent lights are all alight at once. At others there is hardly light enough to show the iron standard. These eccentricities are certainly not confined to Exeter.

A short time ago the Yeadon District Council received an intimation from the Board of Trade that, unless steps were taken within the ensuing twelve months to put into operation the Electric Lighting Order obtained in 1894, the Board would seriously consider whether or not to cancel it. Mr. J. Enright was thereupon engaged to advise the Council on the best method of carrying out the powers they possessed. In his report he says that, from an examination of the township, and taking the price of gas and all the circumstances into account, he estimates that, within a year or so from current being available for lighting, the Council would have wired the equivalent of 4500 8-candle power lamps. He suggests the provision of plant at an estimated expenditure of £12,600. The annual expense he puts at £1540; and the yearly income, including £160 from the street-lamps, at £2035. He fixes the price per unit at 5d.—a figure which he strongly advises the Council not to exceed.

Misfortunes crowd upon the Manchester Corporation Electricity Department; but the officials may find a little consolation in the knowledge that they are gaining a large and varied experience of the many disorders to which an electric light system is subject. The latest mishap occurred about half-past five on Monday evening last week. At that inconvenient hour, a reporter writes, "the electricity supply went wrong, and the city was suddenly enshrouded in darkness. At business establishments where the electric light is duplicated with gas, the difficulty was quickly overcome; but at many places candles had to be temporarily used as the only available illuminant. As the interruption had not been corrected until considerably after six o'clock, some alarm began to be felt for the success of the entertainments at the theatres in the city. Mr. C. H. Wordingham, the Electrical Engineer, however, was able to locate the spot where the 'hitch' had occurred; and at half-past six the engines at the works in Dickinson Street were again running full speed, and the supply of light was renewed."

The Cardiff Corporation Electrical Committee have been investigating the causes of the frequent failures of the electrical service in the borough. As the result, they seem to be pretty well convinced that their system is not all that could be desired, and that it is necessary there should be a more methodical management of the department. The system adopted by Cardiff, it is stated, compels the use of rectifiers; and it is to these rectifiers that eleven out of fourteen failures are attributed. As to the other point, it is apparent the Engineer (Mr. Applebee) has hitherto had very limited powers over his subordinates; but now he is to have entire control of the whole of the staff for the next six months. Altogether, the Engineer seems to have had more than enough to do in the past, and has not had sufficient freedom of action for a man holding his responsible position. To this, and to the shortsightedness of the Committee (who seem to be endowed with a fair share of pomposity), is due, perhaps, much of the trouble that has come upon the department. During the six months' experiment (it is nothing more), it is to be hoped that the people of Cardiff will be relieved—if not entirely, to a large extent—from the constant difficulties which they have experienced since the advent of the electric light in their streets.

THE FINAL REPORT OF THE METROPOLITAN WATER COMMISSION.

We conclude to-day our abstract of the document by dealing with the suggestions made by the Commission on the subject of control.

It may be remembered that the Commissioners were directed to inquire whether, in the event of the water undertakings not being acquired, "additional powers of control should be exercised by local or other authorities;" and, if so, "what those powers should be." A wide divergence of opinion upon the meaning of the word "control" was made apparent in the course of the inquiry. The London County Council submitted to the Commission a paper which contained, among other things, the following conditions of control in the event of there being no purchase by a public authority:—

I.—Present System of Control.—(*a*) Extent of control as affecting finance and quality and quantity of water. (*b*) General powers of the Local Government Board; no authority representing Londoners has any power of control. (*c*) Insufficiency of present control. (*d*) Present remedies of consumer inadequate.

II.—Further Provisions for the Future.—(*a*) County Councils in London and outside to have power to analyze water, and to compel Companies to improve method of treatment, and make provision against possible failure of supply; to demand returns and improved form of accounts; to appeal to Auditor against items of expenditure. (*b*) Avoidance of agreements between the Companies, so as to bring into activity the competition intended by Parliament to operate for the benefit of the consumers. (*c*) As an alternative to competition, compulsory amalgamation. (*d*) Reduction of rating powers—(1) to one uniform basis over the whole county; (2) to such figure as will carry out the intentions of Parliament in 1852. (*e*) Limitation of power of charge for sale of water. (*f*) Revision of nominal capital. (*g*) Limitation of dividend to total amount actually paid at the present moment; balance to be devoted either to rebate to consumers or to reduction of charges for water supplied for public purposes. (*h*) Limitation of the quantity of water to be taken from the Thames and Lea, independently of any permission given by the Conservators of those rivers. (*i*) Obligation upon Companies to bring into Parliament forthwith proposals for additional supplies adequate for the requirements of the next sixty years. (*j*) Obligation upon Companies to forthwith carry into full effect the requirements of the Royal Commission of 1892-3 with regard to the waters of the Thames and Lea.

Mr. Dickinson, the Chairman of the Water Committee of the Council, was careful to explain to the Commission that this summary represented only various heads which the Council thought worthy of consideration, and not a suggestion of the control they recommended. The position of the Council was that no control could be a possible settlement; and until they saw a definite, well thought-out scheme of control, they said purchase was the only solution. They came to the conclusion that, however efficient control might be, the question of purchase must crop up again in a very few years. They believed it to be impossible to formulate any scheme of control. The Commissioners express the opinion that measures of this kind, "which consist in depriving the Companies of the statutory rights on the faith of which their share and loan capital has been subscribed," cannot properly be described as measures of "control." They understand by "control," measures by which "the due performance of the existing statutory obligations of the Companies can be efficiently and conveniently secured and enforced."

Having set out the main obligations of the Companies, as defined in the Water-Works Clauses and other Acts, the Commissioners remark that these various enactments cover the whole ground; and, although criticism may be made on the tribunals selected and on the principle, which runs through all the statutes, of postponing action until a breach of some statutory duty has been committed, they consider it may safely be asserted that some remedy is provided for every such breach. They have been struck by "repeated instances of ignorance or neglect on the part of local authorities and consumers, for whose benefit these enactments were intended;" and they cite a number of cases. This apathy of the local authorities appears to be explained partly by the complexity of the Water Acts, which the Commissioners think stand very much in need of consolidation, and partly by the difficulty of proving a default in any particular instance.

Various suggestions were submitted for improving the machinery of control, and making it more effective. Mr. Dickinson thought there might be effective control if representatives of the London County Council were placed on the Boards of the Companies in a majority; but even this control would not, in his view, reduce the demand for purchase. His suggestion amounted to conferring the whole direction and management of the water undertakings upon representatives of the consumers, whose interests are directly opposed to those of the shareholders, and giving them nearly all the advantages of purchase without any payment or compensation. The representative Directors might reduce water charges, and thereby reduce dividends to a vanishing point. This, the Commissioners think, can hardly be regarded as a practical suggestion. Sir John Lubbock put forward one somewhat similar, but of a more moderate character. The Water Committee of the Corporation of London laid before them, through the Remembrancer (Mr. Prior Goldney), a scheme of control which they suggested was worthy of consideration, and was a possible solution of the question, although they did not go so far as to say it was desirable to adopt it. The Commissioners found the scheme extremely difficult to understand; but they say it went far beyond control, and amounted to a remodelling of the whole system of water supply in a manner which certainly did not seem to them to be advantageous.

Turning to matters which come more properly under the head of control, the Commissioners proceed to consider what additional powers seem advisable with regard to the drawing of water from the Thames, the Lea, and from wells; and with regard to the storage and filtration of the water so drawn, and its delivery and distribution to the consumers. They say it is clear that some effectual means should be provided for ascertaining from day to day the quantities of water pumped by the Companies from the Thames. The Thames Conservancy Act, 1894, appears to them sufficient for the purpose; and the only addition they suggest is that provision should be made for paying the costs of the Conservators in the event of an arbitration taking place under that statute. With regard to the Lea, the existing provisions are less effective. By the River Lea Water Act, 1855, the New River Company are required to maintain a gauge limiting the quantity of water taken by them to 22½ million gallons a day; and this gauge is subject to the inspection and control of the Secretary of State for War. But although there is an enactment requiring that all other draughts on the river by that Company or the East London Company shall be measured by gauges, there is no control provided over them, except by each Company over the gauges of the other. This legislation, in the Commissioners' opinion, requires amendment; and the Lea Conservancy Board ought, they think, to be able to inspect all gauges, and to have the same powers as are possessed by the Thames Conservancy.

One of the most important matters in connection with the purity of a water supply from the Thames and the Lea is the question of subsidence by means of storage and filtration. The Royal Commission presided over by Lord Balfour recommended that, after competent inquiry, regulations should be drawn up prescribing the proportionate area of the filter-beds, the depth of sand, the frequency of renewal, the rate at which water should be allowed to percolate, and the number of days' storage sufficient to obviate the necessity of taking in turbid flood water and to allow of due settlement. They also recommended that the enforcement of the regulations should be entrusted to the Water Examiner. No inquiry such as that Commission recommended has yet taken place, and the present Commissioners think the question is not yet ripe for final settlement. They proceed to deal with the various points raised in evidence before them, and the extent of control they are able to recommend in the present state of scientific opinion.

The first point taken into consideration is whether water should be drawn from the Thames, when the river is in flood, for domestic supply. Sir Alexander Binnie thought none should be taken when the river was in a turbid state. But when he was asked how he would define "turbid" water, he admitted that he was unable to do so without careful inquiry. Floods differ so much in their character that the number of days from the commencement of a flood was a bad test; and he suggested that the difficulty might be met by providing that the water should not be drawn when it contained a certain number of grains per gallon of suspended matter. He deemed it better to lay down a positive statutory obligation, to be enforced by penalties, rather than to leave it to the discretion of the Engineers of the Water Companies to decide when the water was fit to be taken into reservoirs. Mr. Middleton, who represented the Companies, expressed the opinion that it was impossible to define a flood, and stated that he would allow water to be drawn at once into reservoirs in all conditions of the river, leaving it to the Engineer to say how soon he would pass that water on to the filters. With sufficient storage and the use of alternate reservoirs to draw from to the filter-beds, he thought this discretion might safely be allowed.

So much for the engineering evidence. Coming to that furnished by the Chemists, Sir William Crookes stated, as the result of his experience, that water might be taken into the reservoirs at the time of, or at most a few hours after, a flood; and that by filtration, properly conducted, water was turned out practically free from microbes, however many there might have been in the raw water. He added that the microbial impurity of Thames water had much diminished since the passing of the last Thames Conservancy Act. His colleague Professor Dewar regarded efficient filtration as the real security for the purity of the water; and he objected strongly to adopting a more rapid rate because the raw water was assumed to be purer, and to have less sediment in it. The only objection to putting flood water from the Thames on to the filter-beds would, he said, be that they would be sooner choked, and require to be more often washed. Thames water could be effectually filtered by methods now known. The late Sir Edward Frankland differed from the Companies' Chemists to this extent—that he thought, as a rule, when the Thames is in flood, and the raw water contains more microbes, the number in the filtered water was also larger. Notwithstanding this difference, Sir Edward did not absolutely condemn taking flood water into reservoirs; but, in the present state of knowledge, he did not consider it advisable to utilize the very top of the flood, especially the first part, which contains the washing out of ditches and fields. If there were sufficient subsidence reservoirs, he thought that possibly even the top of the flood might be drawn without danger, and that two or three days after the maximum flood the water could be taken with perfect safety.

Although these eminent authorities differed on one point, they were in full agreement upon another—viz., that, in the whole course of their experience, they had never discovered in the filtered water a single pathogenic organism. Sir William Crookes told the Commission that the whole question of microbes was a sentimental rather than a practical one; and Sir Edward Frankland said that no one had yet discovered, even in the raw Thames water, a harmful microbe, and that he had never been able to find even a suspicious one. He was also of opinion that it had not yet been established that the engineers in charge of the filtration could work up to a standard of 100 microbes per cubic centimetre of filtered water as a maximum; that the standard failed to be attained at times, from some unknown causes, both in severe frosts and in summer heats; and that it would be impracticable at present to enforce that standard by statutory penalties.

A scientific witness whose opinion the Commissioners think is entitled to weight was Mr. Groves, the Chemist to the Thames Conservancy. He examines the water of the Thames and the effluents which pass into it, in the neighbourhood of the intakes of the Water Companies, to ascertain the amount of organic impurity contained therein, both in times of flood and when there is no flood. He put in tables showing the results of his investigations; and the conclusion he drew was that the flood waters of the river might safely be taken at any time of the flood. He had carried out experiments which showed that, after settlement, the flood water was better than the average of the water when the river was not in flood. He was therefore of opinion that flood water when placed in a large storage reservoir would, after subsidence, be better than that which was taken from the Thames when it was not in flood. Mr. Walter Hunter, one of the Engineers of the Staines reservoirs scheme, stated that, in his opinion, the first two days of any flood would be sufficient to cleanse the surface of the land and the ditches, and that the rejection of water during those two days would be all that was desirable, by way of precaution rather

than of necessity. Sir Frederick Bramwell and Mr. Hawksley expressed concurrence in this view.

As the result of all this evidence, the Commissioners came to the conclusion that it is unnecessary to impose any restriction upon the taking of flood water from the Thames; and that it may safely be left to the discretion of the Engineers of the Companies how soon after a flood they will draw water from the river. They think it should be imperative on the Companies to pass water drawn from the river into a storage reservoir before letting it on to the filter-beds. The reservoirs provided by the Staines Joint Committee, and those which the Commissioners have recommended in a former part of their report, for any additional supplies to be drawn from the Thames, will, they consider, be sufficient for purposes of subsidence as well as storage.

With regard to filter-beds, their construction, and the rate of filtration—all matters which the Commissioners regard as of the highest importance—they think that the time has not yet come when any detailed regulations thereon can be usefully laid down, either by Act of Parliament or by any controlling authority; and that the wisest plan is to leave the responsibility of these details to the Companies, who should have the task of finding and adopting the best means of getting a good result, rather than to throw upon a Government officer or a local authority the responsibility of the processes to be adopted and followed. The more useful control would, they think, be to test the results of filtration; and, in order that this may be effectually done, they specify some minor regulations which they consider are desirable. The Water Examiner should have the right of entry upon the works of the Companies, and of inspection of every part thereof, including intakes, reservoirs, and filter-beds. At present he is allowed to enter and inspect by the courtesy of the Companies, and no impediment has ever been thrown in his way; but this is not the position the Commissioners think he ought to have. He should be able to enter as of right; and they believe the Companies would have no objection to his doing so. He should have authority to prohibit the distribution of water to consumers from any filter-bed which he finds defective in operation; and disregard of his orders should entail penalties after the first default. During the inquiry, a suggestion was made by the late Sir Edward Frankland that bacteriological laboratories should be established close to the spot whence samples of water are taken; and the Commissioners think these experimental works might be undertaken, in order to ascertain what processes of treatment give the best results, and what bacterial standard of effectual filtration can be reasonably adopted for practical use. The Companies should be required to provide the structural and other facilities suggested by Sir Edward for obtaining and testing samples of water close to the works.

Bearing upon the subject now under consideration, the Commissioners are of opinion that the powers of inquiry into the quality of the water vested in the Local Government Board by the 35th section of the Metropolis Water Act, 1871, should be strengthened by giving to the person appointed by the Board to hold the inquiry similar powers to those of an Inspector holding inquiries under the Public Health Act, 1875. He should have authority to employ experts to make examinations, carry out experiments, and report to him. The Official Water Examiner should have the general direction and control of all the examinations of experts on behalf of the Local Government Board. Their reports should be sent to him and should be periodically submitted by him to the Board, together with his own report. The reports of these experts, if endorsed by the Water Examiner, should, as well as the reports of the Water Examiner himself, have the force and effect of reports made under the 35th section of the Metropolis Water Act, 1871, and the 9th section of the Metropolis Water Act, 1852. The Commissioners think the application of the last section should be extended; and that the Local Government Board should have power, on receipt of a complaint from any local authority or on their own initiative, to order an inquiry into the quantity of water supplied by any Company or as to the pressures maintained. It should be made clear that "frost, unusual drought, or other unavoidable accident," will not excuse a failure of supply, if it can be shown that the failure occurred "because the works of the Company were not in an efficient condition, and had not sufficient reserve capacity of supply." Suggestions were made that local authorities should have powers conferred upon them to enter the Companies' works, take samples of water from their reservoirs, inspect their filter-beds, and make detailed inspection of their works generally. The Commissioners think that if the system of inspection and control by the Water Examiner above referred to is adopted, it would be undesirable to have a duplicate inspection by the local authorities.

Another point of importance in connection with a proper water supply is the pressure at which the water stands in the mains. Mr. Dickinson, speaking for the London County Council, expressed the opinion that the pressure at every hour of the day should be reported to whatever authority had the control of the Companies. The Commissioners recognize that some caution would be necessary in drawing conclusions from a return of pressures; but, upon the whole, they think it would be reasonable to require the Companies to record and return to the Water Examiner the pressure in their service-mains at certain specified hours, and also the minimum depth of water in their service-reservoirs in each 24 hours. They do not advise that any power of prosecution or suing for penalties should be vested in the Water Examiner, if the returns show that the Companies are not acting up to their statutory duties. They think it is better that he should communicate the returns to any local authority in whom the law vests a right of proceeding; leaving them to take such action as they deem proper.

A further matter in respect to which additional control was much insisted upon before the Commission was the pumping operations carried on by some of the Companies. It was contended by witnesses who appeared on behalf of the county of Hertford that the pumping of the New River and East London Companies had diminished the flow of the Lea, had caused other rivers to rise far below their usual source, had either exhausted or diminished the yield of springs, had lowered the level of various private wells, and had depleted the reservoir of water in the chalk above as well as below the points of pumping. The same contention was made before Lord Balfour's Commission, and was carefully investigated by them. The conclusion they came to was that both facts and theory failed to support the contention. The present Commissioners did not feel that they were either qualified or empowered to review this judgment of their predecessors; and they declined to reopen the question. Moreover, it was made clear that, even if the facts and the theory of these witnesses were true, the Companies were doing no more than the law entitled them to do; and that the only practical step which could meet the alleged grievance was an alteration of the English law as to underground waters. They were clearly of opinion that it was beyond their province to consider or advise a change of the law such as that. They, however, express concurrence in the recommendation of the Balfour Commission that "distinct obligations should be laid upon any Company or local authority who are allowed to pump water from the chalk for purposes of public supply, to keep accurate observations of the effect of their operations on the level of the water in the wells from which they pump, and return the results to the Water Examiner, under such regulations as may be framed."

With regard to financial matters, the Commissioners consider the provisions of the Act of 1871 satisfactory and sufficient. The London County Council wished that the Companies' accounts should show how much they received for domestic, and how much for trade supply. This matter appears to have already been under the consideration of the Local Government Board; and the Commissioners say that Board, if they think fit, can at any time require this information to be given under their existing statutory powers. The Council also desired to have the power of appearing before the Official Auditor, for the purpose of challenging items of expenditure, or their allocation to capital and revenue account respectively. The Commissioners point out that if this power were granted to the Council it must also be given to the Councils of all the Metropolitan counties within which the Companies have powers of supply; and they do not think the intervention of all these bodies would tend to improve the character of the audit. There is, however, a blot in the system of audit which they think should be remedied. If the Companies feel aggrieved by any decision of the Auditor, the matter in difference is referred to arbitration, and the Auditor has to fee Counsel and pay his own costs of the arbitration. The Commissioners consider that provision should be made for paying these expenses out of public moneys, as the Auditor is a public officer; and that he should not be discouraged from asserting his views, in opposition to the Companies, by the prospect of being out of pocket if he does so.

We now come to a very interesting part of the report relating to control—that dealing with the subject of the prevention of waste. This, as the Commissioners point out, is rather in aid of than against the Companies. According to the figures they were able to obtain, the supply per head varies greatly between the different water districts, and between one year and another. The tables in the Water Examiner's returns to the Local Government Board show the daily average supply of water per head given by the different Companies from 1891 to 1897 in each year. The daily average supply per head of all the eight Companies was in 1891, 32·08 gallons; in 1892, 33·20 gallons; in 1893 (a year of drought), 35·46 gallons; in 1894, 34·77 gallons; in 1895 (a year of great frost), 38·47 gallons; in 1896, 35·31 gallons; and in 1897, 35·43 gallons. Between the several Companies the differences are striking; the Grand Junction Company being the most extravagant. The annual average daily supply of this Company reaches and exceeds 44, 48, and 48 gallons per head, as compared with 29, 31, and 29 gallons per head supplied in the same years by the Kent Company. The explanation given by the Engineer of the Grand Junction Company was that they found it cheaper to pump water to waste than to prevent the waste. The Chelsea Company also gave supplies in excess of the average during the whole period from 1891 to 1897; and the East London Company, from 1891 to 1895. The Commissioners say that a great deal of this excessive supply is due to preventible waste. The Chelsea Company have lately, however, vigorously prosecuted the inspection of waste, and have applied the system of Deacon's waste-water meters to parts of their district. In one portion of their district, they have reduced the supply per head for domestic purposes and businesses not supplied by meter from 25 gallons to 18·6 gallons per head. In some portions of this area, the reduction was about 50 per cent.—from 39·5 to 19·5 gallons, and from 30·3 to 15·5 gallons per head. This reduction has been brought about by effective supervision of the waste due to imperfect fittings. The average daily supply per head of the Chelsea Company has for some years been over 43 gallons, including trade supplies. To the 18·6 gallons above mentioned, trade supplies would add about 4½ gallons, making (say) 23 gallons per head instead of 43. The East London Company supplied the Commissioners with a table showing the reduction of supply effected by more careful supervision with the help of Deacon's waste-water meters. In six districts of their area, the number of gallons per head had been reduced by considerable amounts—*e.g.*, from 52·70 to 38·86 gallons, from 32 to 26·94 gallons, and from 38·78 to 26·35 gallons. Since constant supply was resumed by this Company in 1898, the average daily supply per head for all purposes has been about 28½ gallons; whereas in previous years it ranged from 32·58 gallons in 1896 to 40·02 gallons in 1895. On behalf of the Southwark and Vauxhall Company, the Commissioners had put before them tables of a like kind; showing how, by repeated inspection, great reduction of consumption followed the prevention of waste, and this "without the inhabitants being aware that any reduction had been made in the amount of water passing through their pipes." The Lambeth Company have made the same efforts at inspection and prevention of waste, with the result that in 43 districts having 22,707 out of their total number of 110,000 supplies, with a population of 158,000 persons, they have reduced the consumption from 30·54 to 19·76 gallons per head per day.

It appears from the report that the New River Company have carried the waste-water meter system farther than the other Companies, and have applied it to 145,000 out of the 151,000 houses that have constant supply in their district. They have also succeeded in inducing 95 per cent. out of the new supplies to adopt fittings tested and stamped by the Company. To these two causes is due a large reduction in the consumption of water per head per day. Mr. Collins, their Distributing Engineer, put in a series of tables furnishing the results arrived at in various districts of the Company's area. They showed that supplies of 36·8 gallons and 47·2 gallons per head per day were brought down to 15 and 10·8 gallons. Mr. Collins also supplied particulars of two abnormal districts which are of special interest. One is in the City of London, where the population are largely printers, working by night as well as by day, and using water for washing type. The consumption there per head per day is 59·4 gallons, of which 32·8 gallons are used in the day-

time, and 26·6 gallons at night. The other district is in Finsbury Park, where the consumption, not including metered supplies, per head per day ranged from 105·4 gallons in June, 1897, to 32·5 gallons in September, 1897, of which 18·3 and 24·9 gallons were used by day, and 87·1 and 7·6 gallons respectively by night. This large night consumption was due to the inhabitants letting their garden hoses run all night. The Company do not think it worth while to meter these services, even assuming they are entitled to do it, owing to the expense of a meter supply; and they make only a small charge for the gardens, because people would not pay a high one. The exertions of the Company have reduced the supply per head per day throughout their district, which is a fairly representative one, containing houses of every class, to 30·5 gallons in 1896, and 31·5 gallons in 1898. The Commissioners point out that if all the London Water Companies had reduced their supply to the same figure, there would have been a saving of 28,006,049 gallons a day in 1897, and 22,743,253 gallons a day in 1898, during which year the East London Company were not giving their full supply for some months. If this saving could be effected, not only would a considerable amount of money be saved, but the problem of finding a sufficiency of water for the supply of London would be rendered less difficult.

When the population of Water London reaches the estimated number of 12 million persons in 1941, a difference of 5 gallons in the consumption per head per day will represent an addition of 60 million gallons to the daily supply. Taking even a moderate estimate of the works that would be necessary to supply 60 million gallons, the Commissioners think it will be found that the interest and sinking fund on the money borrowed to execute these works, and the cost of distribution, maintenance, and management, would not be far off half-a-million a year. This, they say, would be "the penalty for waste to the extent of 5 gallons per head per day." The Commissioners remark that in some cases this waste of water, which benefits nobody and is wholly indefensible, proceeds from wilfulness or neglect, as when taps are left running all night, or are even cut off and removed bodily. In such cases, the remedy is under the penal clauses of the Water-Works Clauses Act, 1847, and of the Metropolis Water Act, 1871. The latter Act appears to give a company the further power of cutting off the supply of any person who fails to do what ought to be done in order to prevent waste of water. The provisions of the Act of 1871 are now extended to the whole area of supply of the Companies. These provisions appear to the Commissioners to be sufficient. There exists some doubt as to whether the Companies have the right to insist on charging by meter for non-domestic supplies. The Commissioners think it should be made clear that they are to have this right, which might possibly enable them to check such cases of abuse as that of the Finsbury Park district above described.

In many cases, of course, waste is due to imperfect fittings; and the Commissioners express the opinion that if the Water Companies were authorized to insist on all fittings being tested and stamped by themselves, they could prevent a great deal of this waste. Several of the northern towns have adopted it; Bradford being one of them. This borough introduced the regulations in 1893, and the result was that the consumption of water, which had averaged 24 gallons per head per day, was reduced to an average of 17½ gallons. Mr. Hawksley supplied the Commissioners with a table showing the consumption of water in 15 large provincial towns in the year 1897. The average per head per day, for domestic and unmetered trade supplies, was 18·18 gallons; and the average metered supply per head per day was 10·26 gallons—making a total of 28·44 gallons per head per day. They think the Water Companies may properly be empowered to require that all fittings shall be approved and tested by themselves, and shall be renewed or repaired from time to time on their requisition, and brought into conformity with regulations properly framed. There appears to be a jealousy on the part of some of the local authorities to giving these powers to a trading company. The Commissioners see no ground for it. They say the prevention of waste is a matter of public interest, as it ensures the sufficiency of the supply of water under the growing demands of an increasing population. Moreover, the Companies who supply the water are best able to detect the waste, and have a private interest in preventing it, which does not exist where the supply is in the hands of public authorities. No legislation is necessary to introduce the new regulations they recommend. The Act of 1871 enables the Companies to propose new regulations for the approval of the Local Government Board. The Commissioners consider the Companies have been remiss in not proposing a change before now; and they feel assured that the Board would not withhold their approval of regulations calculated to prevent a public evil.

The Commissioners cite the question of cisterns as an illustration of the need for intelligent revision of the regulations, and even of the legislation, on the subject of fittings—a cistern being a "fitting" in the language of the Metropolis Water Act, 1871. Neither the regulations, nor it seems the Special Acts of the Companies, prescribe the size or character of the cistern which the Companies are entitled to require before they lay on water to a house for the purpose of a constant supply. They are, therefore, obliged to be content if a cistern of wholly inadequate size is put into a house. Moreover, it not infrequently happens in the Essex district of the East London Company that a cistern is put into a house by the builder, who applies for water to be laid on, and as soon as that is done he removes the cistern into the next house, where the same process is gone through; so that one cistern does duty for a whole row of houses. The Commissioners were informed that the Company are powerless to prevent this state of things; that the question whether they are entitled to recover penalties for the removal of a cistern is doubtful; and that the question whether they can cut off the supply of a house which is without a cistern is now *sub judice* in an action against the Company. Under these circumstances, the Commissioners do not consider it would be becoming in them to offer any opinion of their own as to the effect of sections 24, 30, and 33 of the Metropolis Water Act, 1871. They consider, however, "that the Company or body which supplies water, whether the supply be constant or intermittent, should have power to require that a properly constructed cistern, approved by them, of dimensions proportionate to the number of persons likely to inhabit the house, should be placed, and should remain in good order and repair, in any house supplied with water; and should further have power, if the cistern is removed or is out of order, either to cut off the supply of water to the house, or to replace or repair the cistern, at the expense primarily of the occupier and ultimately of the owner of the house." The local authorities, as guardians of the public health, may, they think, be empowered to see that cisterns are properly cleansed, or that their construction is modified so as to prevent fouling of the water; but they should not have power to order the removal of a cistern altogether, unless it is at once replaced by another.

In a previous part of their report, the Commissioners adverted to the consolidation of water legislation as being desirable with a view to ensuring efficient control. They think there are some matters in respect of which amendment is needed. In the event of failure of duty by a Water Company, the existing remedies, by action for heavy penalties or by application to the Railway Commissioners, are useful chiefly for the larger questions which may conceivably arise as to the quantity and quality of the water supply. But the Commissioners consider they are "too cumbrous and expensive" for the minor cases which arise from day to day, and in which a householder has supplied to him water which is bad in quality or deficient in quantity. For these cases, they think that there should be an extension of the provisions of the Water-Works Clauses Act, 1847, and that the householder should be able to apply to a Police Magistrate, and recover some minor penalty, if his supply is bad or deficient, or if the charges demanded of him are excessive.

Another matter which, in the opinion of the Commissioners, calls for amendment is this: There is at present no statutory obligation on the part of the Water Companies to furnish either the Local Government Board or the Water Examiner with information regarding their works or supply. All the information on these subjects which now appears in the monthly reports of the Examiner or in his annual report to the Local Government Board is supplied as a matter of courtesy. As these reports have been used in the course of inquiries by Parliamentary Committees and Royal Commissions as authoritative sources of information, the Commissioners think that power should be given to the Local Government Board to prescribe periodical returns containing such information, or to call for special statements, plans, or documents, from time to time, as may appear to them to be necessary or desirable; and it should be a statutory duty of the Companies to supply all such returns, statements, or plans.

While on the subject of the jurisdiction of the Local Government Board to institute inquiries, the Commissioners put forward the view that this jurisdiction, or that of the Railway Commissioners, upon whom judicial powers were conferred by the Metropolis Water Act, 1897, might be usefully extended in another direction. The suggestions of the Commissioners on this matter are so important that we give in full the paragraph of their report. It runs as follows:—

> One matter of considerable importance is now left entirely without control—that is, the provision made by the Companies for future wants. It is obvious that a Company, in order to be in a thoroughly efficient state, should have a reserve capacity of supply in excess of its average wants, and sufficient to meet contingencies and cases of emergency. It ought also to exercise a prudent foresight, and to set about such works as increased reservoirs, enlarged filter-beds, and increased pumping power, in advance of the time when they will actually be required, if the supply is to remain constant and efficient. Those who believe in individual enterprise will think that the responsibility of providing in time for future wants had better be left to the Companies, whose interest will inspire them with prescience and with sufficient motive to take all necessary precautions. On the other hand, in the case of a Company whose dividends are low, there is a tendency to save capital expenditure by not maintaining a reserve capacity of supply beyond their average wants, or not commencing in time to make such additions to their works as the increase of population will ultimately require. There are also cases in which a Company, anxious to provide for the future, cannot induce Parliament to give them the necessary powers. The failure of the East London Company to maintain a constant supply in 1898 might have been prevented, or mitigated, if Parliament had not in 1893 rejected the Bill by which they asked for powers to construct additional reservoirs; and the same Company have again in the present year been prevented by Parliament from extending their reservoirs.* Weighing all these various considerations, and feeling strongly the difficulties that surround the subject, we are inclined to think that it would be useful to extend the powers of inquiry of the Local Government Board under section 35 of the Metropolis Water Act, 1871, so as to include inquiry into the provision made by a Company for the present and future wants of their area of supply. Such an inquiry ought to be made only upon the initiative and under the responsibility of the Local Government Board. Any order that they may, after inquiry, make upon a Company, must, of course, be conditional upon the Company obtaining the assent of Parliament to the powers necessary to carry out the order. It seems improbable that Parliament would refuse to grant the powers necessary to comply with an express decision of the Local Government Board.

We have deemed it advisable to quote this paragraph *in extenso*, in view of the fact that the Bill which the associated Water Companies are promoting this session, and of which notice was, of course, given last November, has been framed to confer upon the Local Government Board the power suggested by the Commissioners.

Before parting with the subject of control, the Commissioners add that the recommendations they have made appear to them to be equally applicable and desirable whether the water undertakings are purchased or not. Some of the witnesses for the London County Council claimed that, if purchase by a municipal authority took place, that authority should be left totally without control, and that the consumer should have no remedy if his supply of water failed, or was bad in quality. This was not, however, the opinion of other witnesses. Sir Alexander Binnie thought the same control which was proper for the Companies should also be applied to the County Council if they were the purchaser; and Sir Arthur Arnold thought he should like the Council, after purchase, to be subject to the same methods of control as the Companies, although he was of opinion it was unnecessary, as representatives of the people could be thoroughly trusted. Without expressing the least distrust of any representative or other public authority, the Commissioners think the various measures of control they have suggested—such as checking the quantity of water drawn from the Thames and the Lea, conditions of storage and filtration, control by the Water Examiner, and so forth—

* The report is dated Dec. 30, 1899; and the reference is, of course, to the Company's Bill of last session.—ED. J. G. L.

should certainly be kept alive in the event of purchase. The machinery of penalties would, of course, have to be altered and reconsidered when dealing with a public authority.

The remaining question referred to the Commissioners—namely, the practicability of connecting two or more of the different systems of supply now administered by the Water Companies, the cost of such connection, and the legal powers necessary to give effect to the arrangement—was dealt with in their first report, issued on Jan. 19, 1899; and they say they have nothing to add.

WEST MIDDLESEX WATER-WORKS COMPANY.

A Special General Meeting of the proprietors was held at the Offices, Marylebone Road, on Tuesday last—Mr. E. Boulnois, M.P., presiding—to consider the Bill in Parliament for conferring further powers upon the Local Government Board, and for imposing further obligations on the Metropolitan Water Companies, &c.

The Solicitor (Mr. Gillett), at the request of the Chairman, explained the provisions of the Bill.

The Chairman, after expressing his readiness to answer any question, reminded the proprietors that the Local Government Board, by a Government Act of last session, were empowered to call upon the Water Companies to present schemes for an interchange of water, in order to prevent a deficiency of supply in any district in the Metropolis. The Companies now proposed (those whose names were attached to the Bill, at all events) that this should be further extended—that the Local Government Board should be empowered to call upon the Companies to present schemes for the storage of water from the Thames, and to appoint an inspector to hold an inquiry into any such schemes; the Companies to be bound to carry out those which were reported on as being advisable. It was a singular thing, but it was a fact, that the Companies who were promoting the Bill had anticipated the report of the Royal Commission, which distinctly laid it down that it was advisable that the Local Government Board should have more powers of control in the direction indicated; and to show that they were perfectly ready that a State Department should have such control, the Companies—some months before the report of the Royal Commission was issued—determined that they would go to Parliament and place themselves under such State Department, who should say what was desirable and what was not with regard to storage schemes in the valley of the Thames. Another important point in the Bill was that the Local Government Board were to have the power to say that the Companies might, on occasions—of course, with the consent of the Thames Conservators—take more water than they could legally do at the present time from the river. It seemed a most ridiculous thing that the Companies should be tied down to a certain amount of water from day to day, when there was plenty in the Thames, and when it would be most advisable to take the water, and store it, in order to avoid anything like a deficiency during the hot weather. The Bill now before the meeting proposed to alter this, and also to give the Local Government Board the other powers he had mentioned. He concluded by moving—"That the Bill now read, entitled 'A Bill to confer further powers upon the Local Government Board, and to impose further obligations upon the Metropolitan Water Companies, with a view to providing for the future needs of the Metropolis in regard to the supply of water,' be, and the same is, hereby approved, subject to such additions, alterations, and variations as Parliament may think fit to make therein."

The Deputy-Chairman (Mr. Jackson Hunt) seconded the motion, which was carried unanimously, without discussion.

SOUTHWARK AND VAUXHALL WATER COMPANY.

A Special General Meeting of the proprietors of this Company was held last Tuesday, at the Offices, Southwark Bridge Road—Alderman Sir Henry E. Knight in the chair—to consider the Bill in Parliament "to confer further powers upon the Local Government Board and to impose obligations upon the Metropolitan Water Companies with a view to providing for the future needs of the Metropolis in regard to the supply of water."

The Secretary (Mr. Montague Watts) having read the notice convening the meeting,

The Chairman proposed a resolution approving the Bill, which, he remarked, was exceedingly simple and very short. It was founded upon the experience which the Chairmen of the Water Companies had gathered as to what would be considered an improvement in the position of the Companies as regarded the public, and for setting at rest any doubts which might have existed in the minds of some as to the possibility of the Companies putting themselves in such a position that the water supply of the Metropolis, or any portion of it, could not in any circumstances be jeopardized. He then referred to the report of the Royal Commission, and said he desired to read a paragraph from it, because if the proprietors paid attention to it they would see, when he came to explain the Bill, how thoroughly the Companies had anticipated the report. The paragraph he referred to was No. 185, in which the Commissioners suggest an extension of the powers of the Local Government Board. [This paragraph is given *in extenso* in our abstract of the report which appears elsewhere.] He expressed a hope that the proprietors would bear in mind this part of the report, for the remarks he had read were exceedingly potent and just. At the same time, it could not be said that their Company, at any rate, had been deficient in making preparations in advance of their requirements, because they placed themselves in such a position, as regarded future needs, that they were enabled last year and the year before to supply a Company wanting water up to 10 million gallons a day. It did not, however, do for one Company alone to be in such a position; every Company should be so. He then explained the various clauses of the Bill. Commenting on clause 10, he stated that it gave the Companies power to act together if two or any more of them thought it better to proceed jointly in constructing a large system of reservoirs. As far, however, as their Company were concerned, they had always kept to themselves; and it was certainly a fortunate thing for London that they had done so, as, if they had taken part in the Staines scheme, London could not have had that assistance which it received owing to their having followed their own plan, and constructed their own reservoirs. Moreover, the Company had saved an enormous sum by their independent action. One of the clauses of the Bill gave the Companies power to construct the reservoirs referred to therein by means of the creation of debenture stock; and a very important point in the clause was that this stock was not to be subject to contribution to a sinking fund. The Companies had promoted the Bill jointly, considering that what was proposed was beneficial for the whole of the Metropolis; and he was very glad to find that it was thoroughly in accord, as the proprietors would have gathered, with the report of the Royal Commission.

Mr. C. M. Vialls seconded the motion.

Mr. H. S. Makins expressed the opinion that the Bill would enable the Local Government Board to make rather onerous conditions against the Companies.

The Chairman said that he did not think so. Before the Board made an order, an inquiry would have to be held, at which the Water Companies would be heard; and they would have to stand on the justice of their cause.

Mr. Makins said he thought that the Companies were doing so many things for their mutual advantage that it might be desirable to consider the question of amalgamating them.

The Chairman: That is quite a matter of opinion. I have a very open mind on the subject myself; but I think if you read the report of the Royal Commission it will enlighten you a little on that point.

The motion was then put and carried unanimously, and the proceedings terminated.

GRAND JUNCTION WATER-WORKS COMPANY.

A Special General Meeting of this Company was held at the Offices, South Molton Street, last Wednesday—Mr. F. Tendron in the chair—for the purpose of submitting to the shareholders a Bill introduced into Parliament by the Metropolitan Water Companies, entitled "A Bill to confer further powers upon the Local Government Board and to impose further obligations upon the Metropolitan Water Companies with a view to providing for the future needs of the Metropolis in regard to the supply of water."

The notice convening the meeting having been read,

The Chairman explained that the object of the Bill was to make provision for the construction, when necessary, of additional storage reservoirs in the Thames Valley, as recommended in the report of the Royal Commission presided over by Lord Balfour of Burleigh. He then submitted a resolution approving of the Bill, and moved its adoption.

The motion was seconded, and at once carried unanimously.

EAST LONDON WATER-WORKS COMPANY.

A Special General Meeting of this Company was held last Thursday at the Offices, St. Helen's Place, E.C., to consider Bills (1) to authorize the Company to construct additional storage reservoirs and other works and (2) to confer further powers upon the Local Government Board. Colonel Lockwood, M.P., presided.

The Secretary (Mr. I. A. Crookenden) having read the notice calling the meeting,

The Solicitor (Mr. Bonner Maurice) explained the Bills; pointing out that the measure which was promoted by the Company themselves authorized them to construct two storage reservoirs and certain cuts, conduits, and other ancillary works. It also enabled them to take the necessary lands, and, under certain conditions, and with the consent of the Local Government Board, to take a further quantity of water from the Thames for emergency purposes. The Bill also empowered the Company to raise by debenture stock, under the auction clauses, and subject to the sinking fund, £1,800,000 for the purposes of the proposed works. With regard to the second Bill, it was promoted by other Companies as well as by the East London Company; and he drew attention to its main objects.

The Chairman then stated that the first Bill was practically identical with that which was passed by the House of Commons last session, but which was unfortunately rejected by a Committee of the House of Lords. Its main provisions were to enable the Company to construct the necessary reservoirs for the purpose of catching and retaining the water which was now allowed to run to waste in hundreds of millions of gallons into the sea in wet seasons, so that it might be stored and purified and distributed to the Company's district in dry periods. The Bill was entirely consistent with the recommendations of two Commissions, including that which had just finished its labours. The second Bill was a joint measure promoted by some (not all) of the Companies for the purpose of establishing a like provision in respect to the Thames waters—a policy which had also been approved by the two Commissions mentioned. Both schemes might be considered as having been preferred by the Royal Commission to the more extravagant and doubtful policy of going to Wales for water while there were such enormous quantities at their doors, if there were but the means of taking and holding it against possible drought. The broad policy involved in the schemes was one which was accepted and approved by all dispassionate authorities; and he thought it might be fairly hoped that the Government, under the terms of the report of the Royal Commission, would cordially approve of the measures. He concluded by moving a resolution approving the Bill to authorize the Company to construct additional storage reservoirs and other works, to take further water from the River Thames in cases of exceptional drought and other emergency, to raise further money, and for other purposes, subject to such additions, alterations, and variations as Parliament might think fit to make therein and as the Directors should approve.

Sir Herbert Barnard seconded the motion, which was carried unanimously.

The Chairman afterwards proposed a resolution approving the Bill "t o

confer further powers upon the Local Government Board, and to impose further obligations upon the Metropolitan Water Companies with a view to providing for the future needs of the Metropolis in regard to the supply of water."

Mr. G. BANBURY seconded the motion, which was carried unanimously.

CHELSEA WATER-WORKS COMPANY.

A Special General Meeting of this Company was held last Thursday, at the Offices, Commercial Road, Pimlico—Mr. F. S. CLAYTON presiding.

The SECRETARY (Mr. G. H. Gill) having read the notice calling the meeting,

The GOVERNOR stated that the shareholders had been called together for the purpose of considering two Bills—one promoted by the Company alone, and the other by the Company jointly with some of the other Metropolitan Water Companies. Dealing with the Company's own Bill, he stated that it was to confirm the allotment of £34,215 of ordinary stock and the payment of dividends to be made on this stock. As mentioned at the last half-yearly meeting, the Government Auditor had not certified the accounts up to March 31 last. The audit of these accounts took place in May last; and it was the duty of the official to give the Board a formal intimation of the reason why he refused to certify them. He had merely told them, however, generally, that he considered that the issue of this amount of stock was *ultra vires;* but no formal objection had been handed in to the Company from that time to this. He (the Governor) might remind those who were present at the half-yearly meeting that he said he had reason to believe, although the Directors had not heard from the Government Auditor in regard to the specific objection to be taken by him, that the matter would yet be settled, and that the objection might possibly be withdrawn. At that time he thought he was a little optimistic, perhaps, in making the statement; but, as the result had proved, he was not so, for the Directors had had a further intimation from the Legal Adviser of the Government Auditor to the effect that they might possibly receive the certificate confirming the accounts in question. The certificate, however, had not yet been received; and it became necessary for the Board to proceed with the Bill, the purport of which he had explained. The measure also conferred powers on the Company to acquire the fee-simple or freehold of additional land for the purposes of storage, and especially to purchase the reversionary interest in land, subject to a long term of years, already vested in the Company. The proprietors were aware, from previous reports, that 70 acres of land at West Molesey had been acquired on a long term of years; and it was thought desirable that power should be taken by them to purchase the freehold interest in this land. The other Bill, which was promoted by the Company in conjunction with some of the other Companies, proposed to confer powers on the Local Government Board to make an order on any of the Water Companies to provide further storage in the Thames Valley should the Department think fit to make such an order. The measure would not affect their Company so much as it would some of the others, as the Chelsea Company were not likely to require more water from the Thames than they were at present authorized to take, and the 70 acres of land which they had already acquired for storage purposes would, in the Directors' opinion, be amply sufficient for any further storage that might be required by them. At the same time, he should mention that the Bill had been promoted spontaneously on the part of the Companies, and not at the suggestion of anyone outside themselves. They hoped that it might be passed by Parliament, and in due course receive the Royal Assent. He might state that if it were passed it would be a material guarantee on the part of the London Water Companies of their intention to do what might be legitimately required of them to give an abundant water supply to the Metropolis.

The SOLICITOR (Mr. John Hollams) then explained the chief provisions of the two Bills. He stated that clause 4 of the Company's own Bill enabled them to purchase by agreement land not exceeding in the whole 100 acres. Clause 7 provided that the creation and issue by the Company of the shares, to the nominal amount of £34,215, mentioned in the preamble, and their conversion into stock, should be sanctioned and confirmed and declared to be valid *ab initio*. This was a matter upon which the Government Auditor had been pondering for ten months; but there was reason to believe that at last he saw that the difficulties which had occurred to him had no foundation. The clause in the Bill following provided that the dividends paid on this stock had been rightly paid. Power was taken in the Bill to issue not exceeding £20,000 of debenture stock, with the usual clauses required by Parliament as to the issue of the stock if it should be thought worth while. With respect to the Bill promoted by the Companies jointly, it was precisely to the effect mentioned by the Governor; but although, as Mr. Clayton had said, the introduction of the Bill was the spontaneous act of the Companies, it was very remarkable that the Royal Commission in their report had foreshadowed, without having this measure before them, the very principle which it proposed to carry out. It, in fact, followed the principle of the Bill which was introduced by the Government last year enabling one Company to aid another, and empowering the Local Government Board to provide that this should be done. The Bill extended the principle not only to existing sources, but also to new sources of supply in the valley of the Thames. In regard to the schemes mentioned in the Bill, before anything could be done as to carrying them into execution there must be the approval of a public inquiry, confirmed by the Local Government Board; and if there were anything of importance in connection with any scheme, it must also be confirmed by Parliament. There could, therefore, be no hasty proceedings. The other clauses, he thought, were merely formal ones.

The GOVERNOR then proposed a resolution approving the Bill promoted by the Company.

The DEPUTY-GOVERNOR (Mr. Jackson Hunt) seconded the motion.

The GOVERNOR, in answer to a question, stated that the Company had power to take 22 million gallons a day from the Thames; and the Directors believed that this was really in excess of their requirements.

The resolution was carried unanimously.

The GOVERNOR afterwards proposed a resolution approving the Bill for conferring further powers on the Local Government Board, &c.

The DEPUTY-GOVERNOR seconded the motion.

The GOVERNOR, in reply to Mr. H. P. Kelly, stated that all the Companies had joined in promoting the Bill excepting two, and one of these was not a Thames Company.

The resolution was then put and carried unanimously.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 396.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.	£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 13	10½	Alliance & Dublin 10 p. c.	20½—21½	..	4 17 8	150,000	5	Nov. 30	8	Oriental, Ltd. . . .	7—7½	..	5 6 8
100,000	10	,,	7½	Do. 7 p. c.	14—15	..	5 0 0	135,000	5	,,	8	Do. New, £4 10s. pd.	6½—6¾	..	5 6 8
800,000	100	Jan. 2	5	Australian 5 p. c. Deb. .	100—102	..	4 18 0	15,000	5	,,	8	Do. do. 1873, £1 pd.	1¼—1⅜	..	4 11 5
200,000	5	Nov. 15	6	Bombay, Ltd. . . .	5¾—6¼	..	4 8 11	500,000	100	Dec. 1	6	People's Gas of Chicago 2nd Mtg. Bonds .	102—106	..	5 13 2
40,000	5	,,	6	Do. New, £4 paid .	4—4½	..	5 6 8								
880,000	Stk.	Aug. 16	12	Brentford Consolidated	275—280	..	4 5 9	851,070	10	Oct. 13	7	River Plate Ord. . . .	10¾—11¼	..	6 4 5
270,000	,,	,,	9	Do. New . . .	210—215	..	4 3 9	250,000	Stk.	Dec. 29	4	Do. 4 p. c. Deb. .	99—101	..	3 19 3
50,000	,,	,,	5	Do. 5 p. c. Pref. .	140—145	..	3 9 0	250,000	10	Sept. 15	10	San Paulo, Ltd. . . .	12—13	..	7 13 10
159,375	,,	Dec. 14	4	Do. 4 p. c. Deb. .	124—128	..	3 2 6	135,000	Stk.	Sept. 15	10	Sheffield A.	249—251	..	3 19 8
220,000	Stk.	Sept. 15	11½	Brighton & Hove Orig. .	255—260	..	4 8 6	209,053	,,	,,	10	Do. B.	249—251	..	3 19 8
226,320	,,	,,	8½	Do. A. Ord. Stk. .	185—190	..	4 9 6	447,427	,,	,,	10	Do. C.	249—251	..	3 19 8
973,500	Stk.	Aug. 16	5	Bristol, 5 p. c. max. .	125—130	..	3 16 11	5,600,000	Stk.	Aug. 16	5⅓	South Metrop., 4 p. c. Cri.	133—136	..	3 18 5
420,000	20	Sept. 29	10	British	43½—44½	..	4 9 10	1,520,000	,,	Jan. 12	3	Do. 3 p. c. Deb. . .	100—102	..	2 18 10
50,000	10	Aug. 31	12	Bromley, Ord. 10 p. c. .	25—27	..	4 8 11	120,000	Stk.	Aug. 31	6	Tottenham A. 5 p. c. and B. 3½ p. c.	141—143	..	4 3 11
75,000	10	,,	9	Do. 7 p. c. . . .	19—21	..	4 5 8	250,520	,,	,,	4½		102—104	..	4 6 6
500,000	10	Oct. 13	6	Buenos Ayres (New) Ltd.	9¾—10¾	..	5 17 1	55,100	,,	Dec. 14	4	Edmonton 4 p. c. Deb. .	113—117	..	3 8 5
220,000	Stk.	Dec. 29	4	Do. 4 p. c. Deb. .	98—100	..	4 0 0	188,380	10	Jan. 12	5	Turcan, Ltd.	8½—9½	..	5 5 3
150,000	20	July 13	8½	Cagliari, Ltd. . . .	28—29	..	5 13 10	149,900	10	Jan. 2	5	Do. 5 p. c. Deb. Red.	104—104	..	4 16 2
100,000	10	Sept. 29	8	Cape Town & Dis., Ltd.	13½—14½	..	5 10 4								
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	56—58	..	5 3 5								
550,000	Stk.	Oct. 13	13½	Commercial Old Stock .	305—310	..	4 7 1								
200,750	,,	,,	10½	Do. New do. .	240—245	..	4 5 9					WATER COMPANIES.			
200,750	,,	Dec. 14	4½	Do. 4½ p. c. Deb. .	140—145	..	3 2 1	780,399	Stk.	Dec. 29	11	Chelsea, Ord.	307—312	..	3 10 6
800,000	Stk.	Dec. 14	9	Continental Union, Ltd.	177—181	..	4 19 5	150,000	,,	,,	5	Do. 5 p. c. Pref. .	157—162	..	3 1 9
200,000	,,	,,	7	Do. 7 p. c. Pref. .	178—183	..	3 16 6	160,000	,,	,,	4½	Do. 4½ p. c. Pref. '75	145—150	..	3 0 0
51,600	Stk	Aug. 31	14	Croydon A 10 p. c. . .	335—340	..	4 2 4	175,785	,,	Sept. 29	4½	Do. 4½ p. c. Deb. .	148—153	..	2 18 10
168,400	,,	,,	11	Do. B 7 p. c. . .	265—270	..	4 1 5	1,720,560	Stk.	Oct. 13	7	East London, Ord. . .	202—206	..	3 8 0
555,000	Stk.	Aug. 16	5½	Crystal Palace Ord. 5 p.c.	125—130	..	4 0 9	654,740	,,	Dec. 29	4½	Do. 4½ p. c. Deb. .	145—150	..	3 0 0
60,000	,,	,,	5	Do. 5 p. c. Pref. .	140—145	..	3 9 0	890,000	,,	,,	3	Do. 3 p. c. Deb. .	98—100	..	3 0 0
486,090	10	Jan. 26	11	European, Ltd. . . .	20½—21½	..	5 2 4	700,000	50	Dec. 14	7½	Grand Junction 10 p. c. max. .	107—109	..	3 8 10
354,060	10	,,	11	Do. £7 10s. paid .	15—16	..	5 3 2	810,000	Stk.	Sept. 29	4	4 p. c. Deb. .	131—136	..	2 18 10
14,993,075	Stk.	Feb. 9	4 10	Gas-light and Coke 4 p. c. Ord. . .	106—108*	..	4 10 0	708,000	Stk.	Aug. 16	14	Kent	348—353	..	3 19 4
2,500,000	,,	,,	3½		95—98*	..	3 11 5	160,000	,,	,,	7	Do. New, 7 p. c. max. .	200—210	..	3 6 8
3,799,735	,,	,,	4	3½ p. c. max. . .	119—122*	..	3 5 7	1,043,800	100	Dec. 29	10½	Lambeth, 10 p. c. max. .	295—300	+2	3 10 0
3,993,975	,,	Dec. 14	3	4 p. c. Con. Pref.	98—100	..	3 0 0	406,200	100	,,	8	Do. 7½ p. c. max. .	215—220	..	3 12 9
70,000	10	Nov. 15	8	3 p. c. Con. Deb.	125—130	..	5 10 4	350,000	Stk.	Sept. 29	4	Do. 4 p. c. Deb. .	135—138	..	2 18 0
3,800,000	Stk.	Nov. 15	10	Hongkong & China, Ltd.	13½—14½	..	4 10 11	500,000	100	Aug. 16	13½	New River, New Shares	425—430	+2	3 3 1
473,600	Stk.	Feb. 9	3½	Imperial Continental .	215—220	+2	3 8 0	1,000,000	Stk.	Jan. 26	4	Do. 4 p. c. Deb. .	130—135	..	2 19 3
75,000	5	Dec. 14	6	Do. 3½ p. c. Deb. Red.	100—103*	..	5 9 1	902,300	Stk.	Dec. 14	7½	South-wark and Vauxhall Ord. . . .	200—205	..	3 13 2
560,000	100	Oct. 2	5	Malta & Medn., Ltd. .	5—5½	..	4 7 9	126,500	100	,,	7½	7½ p. c. max. .	190—195	..	3 16 11
250,000	100	,,	4½	Met. of 5 p. c. Deb.	110—114	..	4 2 7	489,200	Stk.	,,	5	5 p. c. Pref.	160—165	..	3 0 7
641,920	20	Nov. 15	3	Melbourne 4½ p. c. Deb.	107—109	..	5 0 0	1,019,585	,,	Oct. 13	4	4 p. c. A Deb.	131—136	..	2 18 10
617,946	Stk.	Aug. 31	9½	Monte Video, Ltd. . .	11—12	..	4 2 3	1,155,066	Stk.	Dec. 14	10	West Middlesex . . .	288—293	..	3 8 3
264,855	Stk.	Dec. 29	3½	Newc'tle & Gatesh'd Con.	220—225	..	3 5 5	200,000	,,	,,	4½	Do. 4½ p. c. Deb. .	147—152	..	2 19 3
60,000	5	Sept. 29	7	Do. 8½ p. c. Deb. .	104—107	..	6 12 7	200,000	,,	Sept. 15	8	Do. 8 p. c. Deb. .	100—102	..	2 18 10
				Ottoman, Ltd. . . .	5—5½	−¼							*Ex div.		

* Ex div.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

A question of general importance (the employment of duly qualified tradesmen, at standard rates of wages) was brought before the Corporation of Aberdeen on Monday. It was the Trades Council—those vigorous guardians, everywhere, of the rights of the privileged classes in the ranks of labour—who brought the subject before the Town Council. A deputation from that body, who attended, represented that since 1892 the Town Council had executed a considerable amount of work in the shape of fixing gas burners, stoves, fires, and cooking apparatus generally. Previous to that time, the work had been done by master plumbers throughout the city; and as a natural consequence they were able to employ operative plumbers at a fixed standard rate of wages. Since the Town Council began to extend their operations, the work had been done by their own men; and there is not, it was said, a single operative plumber inside the Gas Department. The most recent development in this connection had been the introduction of the penny-in-the-slot meter; and, so far as was known, there was not a single plumber employed in fixing these meters up. The plumbers considered that they had a reasonable and legitimate claim to some recognition on the part of the Town Council. So far as they had been able to gather, the Town Council had approximately eight employees in the Gas Department. Those employees were paid from 25s. to 28s. per week; while the standard rate of wages recognized by plumbers throughout the city, was 34s. The plumbers had a grievance in respect that the men were not being paid the wages recognized by the trade generally, and that those who were being employed were not qualified plumbers; they had not served their apprenticeship—at any rate, a number of them. In view of these facts, the Trades Council thought it desirable to lay the matter before the Town Council. Lord Provost Fleming assured the deputation that the matter would be carefully considered; and it was remitted to the Gas and Electric Lighting Committee for the purpose. Now, this is quite a different subject from that of the recognition of a Union which claims the right to have a say in the whole management of the undertaking. Workmen are at liberty to combine for the purpose of keeping up wages; and from that there follows the right to see that men who are not qualified are not employed, so as to bring down the wages of those who are qualified. We concede so much to the doctor, the dispenser of medicines, the clergyman, the lawyer, and the accountant; and we cannot, in reason, refuse it to the working tradesman. But those privileged classes employ assistants who are not qualified, and many of whom have no intention of ever qualifying. The lawyer, for instance, employs a staff of copying clerks who are mere copyists, and who never profess to study law. The work they do is cheaper than that of qualified men; and their employment has the effect of keeping qualified men out of work. I know that there is grumbling on the part of passed men, that their bread is taken out of their mouths by those who have not passed; and I know also that these same copying clerks are already grumbling that they are fast losing their work by the introduction of typewriting, nearly the whole of which is done by female labour, at a still cheaper rate than the copyist requires. If we take it, then, that there is a gas-fitting department in the Corporation gas undertaking, in which some qualified plumbers are employed (for the statement of the deputation that they are unaware of any such being employed is scarcely to be accepted), and that labourers, or handy men, are sent to do such work as is involved in the screwing off and on of fittings, the operative plumbers in the city are in no worse position than are countless numbers of people in other walks of life. If they can prove that labourers are employed to do what is strictly plumbing work, the case is different. It is a matter of degree, and not of principle. The Corporation yield up nothing in agreeing to consider the matter; and when they consider it, if there be the same reasonableness on both sides as has been hitherto manifested, there need be no rupture of friendly relations.

The Town Council of Aberdeen, on Monday, disposed of the subject of the chartering of the steamship for the carriage of coal for the gas-works, regarding which there have been complaints of late by Trade Unionists. It was stated on behalf of the Gas and Electric Lighting Committee, that it had been found that the contractor for the discharge of the vessel was paying as high wages as any similar employer in the port, though he was not paying the Union rate. The Committee thought that, in the circumstances, they could not interfere—that, in fact, if they did so, the contractor might hold them liable in damages. The Committee therefore moved that no action be taken. It was moved, on behalf of the Union, that the contract be cancelled, on the ground that the standard rate of wages was not being paid. The action of the contractor was denounced as tending to keep down wages at the port. The recommendation of the Committee was adopted by 25 votes to 4. So far as the Town Council are concerned, this is the end of the matter; but at a meeting of the Trades Council on Wednesday night, it was intimated that it is to be brought up again. The conduct of three labour representatives who voted in the majority was specially held up to desecration.

The Glasgow Town Council, on Monday, dealt with what has the appearance of being an insidious attempt to get the recognition of the Labourers' Union introduced by the thin end of the wedge. A petition by that extraordinarily mobile body, the Gas Workers and General Labourers' Union, had been presented, praying for an increase of wages to the humble body of decayed men who are employed to do sweeping in the closes and courts in the city. The Cleansing Committee, presided over by Mr. Battersby, a Union sympathizer, considered the petition; and the Committee, by 7 votes to 4, recommended that no advance in wages be given. Mr. Battersby, in the Town Council, moved the adoption of this recommendation; and it was likely to be agreed to without comment, when Mr. Graham, apparently perceiving what lay underneath, moved, as an addition to the recommendation of the Committee, that the resolution of the Council be communicated to the men through the Inspector of Cleansing. That Mr Graham was right in his intervention was shown by the alacrity with which the pro-Unionists in the Council attacked him. It was thrown at his head that the Gas Committee, who had refused to recognize the Gas Workers' Union, were in the habit of recognizing the Tinsmiths' Society.

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Mr. W. Stevenson, the Sub-Convener of the Gas Committee, having recalled the experience of his Committee, and hinted that the petition in this instance emanated from the same person who had stirred up the gas workers to action, was taken to task by one of the Union supporters, for this statement; and there was what is commonly called a scene over the matter. After a long discussion, the minutes of the Committee were adopted as submitted; Mr. Graham's proposal being lost. The Council have thus committed themselves to sending a reply to the Secretary of the Union. The answer is a negative one, and therefore does not admit that the Union have exerted any influence over them. It is a question whether it will not be claimed, however, that in sending this reply the Council have "recognized" the Union. As a matter of fact, they have "recognized" it; but their recognition is of the order of the kick downstairs. The question is whether the pain of the kick will not be soon forgotten, and the recollection of the Union be that they were, on one occasion, permitted to hold converse, on terms of equality, with the Corporation of Glasgow. In this view, though the immediate cause was lost, the Union will likely claim that they have obtained a footing. The vote of Monday is therefore to be regretted.

An instance of how a reporter may be made the medium of promoting a movement, without his being aware that he has been harnessed to the car, is furnished by an account which has been published of a meeting at Coatbridge, held last Saturday, for the purpose of forming a branch in that district of the National Union of Gas Workers and General Labourers of Great Britain and Ireland. It is described as "a public meeting, which was largely attended." It is also said that the Chair "was supported on the platform by a host of speakers;" and that "the various speakers spoke at length on the benefits to be derived from union, after which the following resolution was put to the meeting and carried with unanimity: That this meeting of semi-skilled and unskilled workers, recognizing union as a principle of betterment, agrees forthwith to establish a branch of the Gas Workers and General Labourers' Union of Great Britain and Ireland in this district; and that we proceed at once to elect the officials necessary for carrying on the business of the branch." Then it is added: "The meeting was a very enthusiastic one; and a number of men were enrolled as members of the Union." I think it is evident that the reporter was not present, but procured his account of what took place from one who was in the position of being "a ruler of the feast," whose sympathies were pronouncedly in favour of the movement; and that the reporter had not the good sense to sub-edit it. Had the bare facts been given, the narrative would have been slightly different. One thing which would then have been given, and which would have been of more value than all that was communicated, would have been the number of men who joined the Union. The expression "a number of men" would be justified by two. But the object of the author would not have been served had this been stated. I daresay the Union would like very much to have a strong following in the Coatbridge district, where there are many gas workers, for whom they might be able to do something, and many more general labourers, for whom they can do nothing, but whose subscriptions would be useful. It is among the general labourers that the Union will carry on their propaganda with most benefit to themselves; but it is the gas workers whom they will urge to take action. The writer of the paragraph seems never to have reflected that in giving a veiled commendation to this double-headed trouble he was doing that which may result in annoyance and trouble being given to the owners of righteously conducted industries in their midst, and, it may be, in loss both to the owners of those undertakings and to the communities.

When I wrote last week about the report of proceedings of the meeting of the North British Association of Gas Managers at Stirling last July not having come to hand, I fear that I did so in haste. I have to-day received from Mr. R. S. Carlow, the Secretary of the Association, a copy of the book, which bears internal evidence of having been out for some time.

The Gas Committee of the Helensburgh Corporation are finding it extremely troublesome to get a site for a new gasholder, which is much needed. They have already been refused permission by the Sheriff to erect a holder upon a site which they had selected in the outskirts of the burgh. They have, since then, fallen back upon a site beside the gas-works; but as regards this, there is active opposition threatened. At a meeting of the Burgh Commission this week, it was stated that a protest against its erection, signed by 200 householders within the 300 yards' radius of the proposed site, had been received. The Commissioners are helpless in such a state of circumstances. They can only do what is possible to justify their policy before the Sheriff; and that is what has been resolved upon. This is the first occasion in which a second inquiry into a proposal to erect a gasholder has been found to be necessary. Helensburgh is almost entirely a residential town; and in such places it is more difficult to get a site for gas-works or gasholders than it is where they can be mixed up with public work.

It was reported by the Depute Town Clerk at a recent meeting of the Glasgow Sub-Committee on Works that an action had been raised in the Sheriff Court, at the instance of Messrs. John Paterson and Son, Limited, against the Glasgow Corporation, for the sum of £12,974; being the amount alleged to be due to them in respect of extras under their contract for the construction of the tank for the new holder at the Temple Gas-Works. The Sub-Committee instructed the Town Clerk to defend the action.

At the last meeting of the Glasgow Gas Commissioners' Sub-Committee on Finance, Mr. R. M. Mitchell reported that he and his colleagues nominated for the purpose had had a conference with a deputation from the Directors of the Glasgow Workmen's Dwellings Company, Limited, as to the supply of automatic gas-meters to the tenants of houses belonging to the Company, and that they had to recommend prepayment meters to be put into such houses as the Company might require; the Company undertaking to get the tenants to sign the usual form of application for supply. The minute was approved of.

The Newcastle Corporation have accepted an offer by the Newcastle and Gateshead Gas Company of 1000 incandescent Welsbach lamps, similar to those at present burning in Grainger Street, for other thoroughfares in the city.

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HALIFAX	1,000,000
TORONTO	250,000
OTTAWA	250,000
LINDSAY (Remodelled)	125,000
MONTREAL	500,000
TORONTO (Second Contract; Remodelled)	2,000,000
BELLEVILLE	250,000
OTTAWA (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000
ST. CATHERINES (Remodelled)	250,000
KINGSTON, PA.	125,000
PETERBOROUGH, ONT.	250,000
WILKESBARRE, PA.	750,000
ST. CATHERINES (Second Contract)	250,000
BUFFALO, N.Y.	2,000,000
WINNIPEG, MAN.	500,000
COLCHESTER (Second Contract)	300,000
YORK	750,000
ROCHESTER	500,000
KINGSTON, ONT.,	300,000
CRYSTAL PALACE DISTRICT	2,000,000
DULUTH, MINN.	300,000
CATERHAM	150,000
LEICESTER	2,000,000
ENSCHEDE (HOLLAND)	150,000
BUENOS AYRES (RIVER PLATE CO.)	700,000
BURNLEY	1,500,000

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CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Feb.* 10.

Sulphate of Ammonia.—There has been sustained activity in the market, resulting in a further improvement in values; the quotations at the close being £11 17s. 6d. to £12 per ton, delivered f.o.b. at the ports. The buying has been mainly speculative, and for "covering" contracts—consumers having, for the most part, held aloof; but demand has been sufficient to absorb supplies, which continue to be offered as they become available. There has been more doing in the forward position—up to £11 16s. 3d. per ton having been paid, Beckton terms; and the quotation at the close is £12 per ton. In Scotland, £11 18s. 9d. per ton has been paid, f.o.b. Leith, ordinary terms; and a further advance is now required.

Nitrate of Soda is a strong market in all positions. Spot quotation for fine quality is 8s. 9d. per cwt.; and for March delivery, 9s. to 9s. 3d. is being quoted.

LONDON, *Feb.* 10.

Tar Products.—The leading feature in this market is the pressing inquiry for carbolic acid in every strength and form. The embargo placed upon it appears rather to have strengthened its value than otherwise, as to-day it is quoted higher than heretofore. There is a better tone in respect to anthracene, which is now moving a little more actively. The restriction in its production is still going on. Indeed the price for "B" qualities is no inducement to manufacture it. It is worth more money sold in the form of grease oil. Benzols are still marked at the exceptionally low figures that have lately prevailed; but there is more inquiry, and more business being done. This is not an article that can be well stocked, nor is it a desirable stock. Therefore very few makers hold more than "hand-to-mouth" quantities. There is no change in the value of oils; but large quantities are again being consumed for fuel purposes, owing to the high price of coal.

Values obtaining during the week are: Tar, 17s. to 26s. Pitch, east coast, 35s.; west coast, 33s. Benzols, 90's, ordinary, 7d.; special qualities for gas, 8½d.; 50's, 9d. Toluol, 90's, 1s. 2d.; pure, 2s. Solvent naphtha, 1s. 3d. Crude, 30 per cent., naphtha, 4½d. Heavy naphtha, 1s. 2d. Creosote, 3½d. Heavy oils, 3⅜d. Carbolic acid, 50's, 2s. 10d.; 60's, 3s. 3d. Crude naphthalene, 55s. Anthracene, nominal, "A," 4d.; "B," 2½d.

Sulphate of Ammonia is steady at advanced prices. There are very many inquiries from legitimate buyers; and for forward delivery something more might be obtained than is now quoted. The average value at all points may be taken at £11 17s. 6d. per ton, less 3½ per cent.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The spell of severe weather during the past week has necessarily brought an increased demand upon the better qualities of round coal suitable for house-fire purposes, and has lessened any surplus quantities in this direction which previously had been available for augmenting the continued very restricted supplies for iron-making, steam, and general manufacturing purposes. Otherwise, the position remains without any very material change; and there is no further upward move in quoted rates, beyond the special prices which are occasionally obtained where anything like quantities are needed for immediate delivery, and upon orders for shipment. The demand for house-fire purposes is now taking away all that collieries are raising in the better qualities of round coal; and prices are exceedingly strong at the maximum rates of 14s. 6d. to 15s. per ton at the pit for best Wigan Arley, 13s. to 13s. 6d. for Pemberton four-feet and seconds Arley, and 12s. 6d. for common house coal. Common round coals continue in pressing request for steam and forge purposes, with supplies short, and 12s. to 12s. 6d. per ton at the pit readily secured. Engine classes of fuel are also in much the same position; supplies of all descriptions of slack at the Lancashire collieries continuing scarce. The average prices are not under 9s. 6d. to 10s. per ton at the pit for medium, and 10s. 6d. to 11s. for best qualities. In one or two outside districts—notably Derbyshire—prices have been somewhat irregular recently; and collieries here and there are not adhering to the full advance they put on at the commencement of last month. But the increasing pressure that has been coming forward during the past few days for house coals is tending to strengthen the position in this direction; and taking prices all through, they may be said to be very firm. For shipment, there has been quite a pressure of demand in excess of supplies; and 15s. 6d. to 16s. per ton is obtained without difficulty for ordinary steam coals, with 17s. up to 17s. 6d. for the better qualities, delivered at ports on the Mersey.

Northern Coal Trade.—The demand is a little fuller this week; and there is thus abundant work at the collieries. In the steam coal trade, the inquiry is stronger; and the placing of the large orders of the Swedish State Railways has given a better tone to the market. Best Northumbrian steam coals, for prompt delivery, are quoted at 18s. to 18s. 6d. per ton f.o.b.; and steam smalls are rather scarce at 11s. to 11s. 6d. Manufacturing coals are without noticeable change. In the gas coal trade, the demand is still very full, though the consumption is decreasing. There is still a very large shipment of coal to the southern gas companies; and thus the quantity for sale beyond contracts is not very great, while the price (though lower than a fortnight or so ago) seems now steady. For best Durham gas coal the quotation is now about 16s. 6d. per ton f.o.b.; but contracts for Sweden are under negotiation, which are likely to be at a lower figure. The coke trade is firm. Gas coke is steady; but the prices fluctuate largely for different uses. On the whole, they may be said to have an upward tendency.

Scotch Coal Trade.—Strong demand continues for both home and foreign consumption. The foreign is necessarily a forward demand. Prices are, if anything, advancing. The quotations are: Main 14s. 6d. to 15s. per ton f.o.b. Glasgow, ell 15s. 6d. to 16s. 6d., and splint, 15s. 6d. to 16s. The shipments for the week amounted to 207,751 tons—an increase of 17,495 tons upon the previous week, and of 41,727 tons upon the corresponding week of last year. For the year to date, the total shipments have been 809,418 tons—an increase of 147,354 tons upon the same period of last year.

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Tar-Distilling Plants. Valves. Claus' Sulphur-Recovery Plants.

SULPHATE OF AMMONIA PLANTS.

The St. Albans Corporation and the Water-Works.—The fact of the St. Albans Water Company having a Bill in Parliament this session excited in the city a desire for the acquisition of the Company's undertaking. The Corporation, however, were advised that, as there were no complaints against the Company, in regard to either the quality or the quantity of the supply, there would be very little chance of authority to purchase being conferred by Parliament. The project has accordingly been dropped.

The Cost of the Stockport Water Purchase Bill.—Some of the members of the Stockport Town Council were astonished when they read the reports of the Parliamentary and Water Purchase Committee which were presented at the meeting of the Corporation last Wednesday. The reports included charges for parliamentary proceedings and other expenses to the amount of £16,800. It cost £3370 to obtain the Corporation Bill, £6088 for promoting the Water Purchase Bill, and £3896 for stamping the Water Act.

New Issue of Debenture Stock by the Brentford Gas Company.—As will be seen by an announcement which appears elsewhere, the Directors of the Brentford Gas Company are inviting tenders for £46,875 of 4 per cent. perpetual debenture stock of the Company. The minimum price is £115 per cent. The stock offered will come before the whole of the preference and ordinary stock capital, and the interest thereon will rank *pari passu* with that paid on the £159,375 of similar stock already issued. Any amount, not less than £5 or a multiple thereof, may be tendered for. No tender will be received after noon on the 12th prox.; and interest will commence on the 1st of April.

Trial of Sunlight Incandescent Gas-Burners at Oldham.—As the result of the visit of Mr. Arthur Andrew, the Gas-Works Superintendent of the Oldham Corporation, and Mr. Hargreaves, a member of the Town Council, to the Gas and Allied Trades Exhibition recently held at the Royal Aquarium, an order was placed with the New Sunlight Incandescent Company for four lanterns, burners, &c., for trial, to be fixed in front of the Town Hall, to replace the existing gas-lamps attached to the electric light columns. They also ordered a cluster of three burners of extra size and power to be tried on a large lamp at the junction of two important streets in the town. If these should prove to be satisfactory, the Gas Committee will probably extend the system.

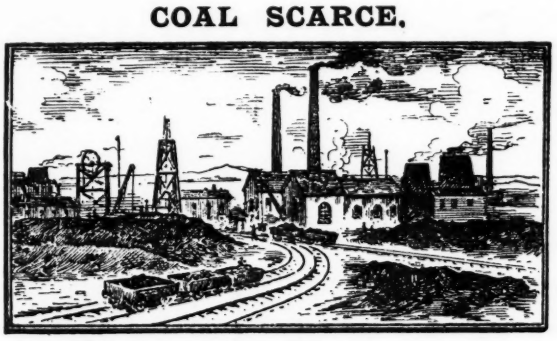
Liverpool and the Water Supply of Wallasey.—In the *agenda* for the meeting of the Liverpool City Council last Wednesday were set forth the heads of the agreement between the Corporation and the Wallasey District Council with regard to the supply of the district with water from Vyrnwy. It was agreed that the water be delivered in a main to be laid by the Corporation from the Vyrnwy aqueduct at Delamere to Wallasey; the price to be 6d. per 1000 gallons; the supply to be measured by meter, but not to be less than 500,000 gallons a day, nor during the next five years more than a million gallons a day; and that for thirty years the Wallasey Council pay 6½ per cent. on the cost of laying the supply-main, and afterwards 1 per cent. for maintenance; the agreement to be determinable by five years' notice on either side. The agreement was passed without discussion.

Opening of Water-Works for Avening.—On Thursday, the 1st inst., the water-works which have been constructed for the supply of the village of Avening, near Stroud, were formally opened by Mrs. Pollock, for whom cheers were heartily given. Mr. Erskine Pollock, Q.C., thanked the assembled company, and stated that the scheme had been in their minds for some years. In its present form it owed its inception to the late Mr. W. Fowles, who suggested it in 1887. Nothing, however, was done till 1895, when it took practical shape. They had been hindered in various ways, but had persevered; and now he was glad the water-works were an accomplished fact. The scheme had proved more expensive than they anticipated. The land and the cost of engineering had been generously given; but the cost had nevertheless been £500. They had most of this subscribed, and he trusted the remainder would soon be provided.

The Welsh Water Bill of the London County Council.—The Parliamentary Committee, the Engineer (Sir A. Binnie), and the officials of the London County Council had some heavy work in preparing the plans and book of reference in connection with their Welsh Water Bill. The book extended to 864 pages, and dealt with many thousands of different properties. It is believed that the deposits in this case are the largest which have ever been made. The area of the land within the limits of deviation is 29,232 acres, the whole of which had to be surveyed and levelled over in detail. The main aqueduct to London is 162 miles long; but, in order to comply with the Standing Orders of Parliament, 276 miles of section had to be deposited. In addition, it was necessary to level over upwards of 250 miles of contour lines. Having regard to the enormous amount of work involved, and to the many difficult questions which had to be dealt with, it is surprising that only one memorial complaining of non-compliance with the Orders was presented; and in this case the allegation, it may be remembered, was not sustained before the examiner.

Social Gathering of Employees of the Glasgow Corporation.—Last Thursday, the annual social meeting of the employees at the Dawsholm and Temple Gas-Works of the Glasgow Corporation was held in the Burgh Hall, at Maryhill. Lord Provost Chisholm, of Glasgow, presided; and among those present was Mr. W. Foulis, the Corporation Gas Engineer. The Lord Provost referred in sympathetic terms to the absence of Mr. A. Wilson, the Manager of the works, through illness, and proposed that the meeting should pass a resolution expressing sympathy with him. The proposition was acquiesced in. The Chairman said he would not trouble the meeting with a long speech; but he could not sit down without referring to the great enterprise in which most of those present were engaged. It was the first enterprise the Corporation took up, and they were so successful that it encouraged them to engage in others. It was eighty years since gas was first used in Glasgow; and as an instance of how the consumption had increased, he stated that in the Maryhill district alone at the present day they used 50 per cent. more gas than was necessary for the whole of the city forty years ago. The Lord Provost, in conclusion, referred to the good feeling existing between the Corporation and the employees.

COAL SCARCE.



There is a tide in the affairs of men (and Gas Departments), which, taken at the flood, leads on to fortune.
Julius Cæsar IV., 3.

STOVES PLENTIFUL.

Explosion at the South Shields Gas-Works.—Last Wednesday morning, an explosion of gas occurred at the South Shields Gas Company's works. It appears that a large sewer running through the yard had become charged with gas, which, consequent upon the action of the severe frost, was unable to find exit. By some unexplained means the gas in the sewer exploded, fortunately without doing serious injury. The roof and windows of the gas offices suffered, as did also the windows of a neighbouring school; but no damage beyond this is reported.

Lighting of Boyle (Co. Roscommon) by Acetylene.—The Read-Holliday Acetylene Company, Limited, of Huddersfield, have lately completed an installation of acetylene lighting at the above-named town; and it was put into operation for the first time on the 1st inst. According to the "Roscommon Herald," "the brilliancy of the illuminant far exceeded the most sanguine expectations of the people of the town, all of whom expressed their highest approval of the light," which, it appears, has been obtained at a low figure. Gratification is expressed at the completion of the Company's contract well within the specified time.

The London County Council and Gas Testing.—At the meeting of the London County Council last Tuesday, the recommendation of the Public Control Committee referred to in the "JOURNAL" last week (p. 345)—that, in the event of the Brentford, Crystal Palace, Mitcham, and Wandsworth and Putney Gas Companies applying to Parliament for increased powers, the Parliamentary Committee should be instructed to oppose the Bills, and to endeavour to obtain the insertion of clauses giving the Council similar power to test gas supplied by the Companies to that in force with regard to the gas supplied by the Commercial, Gaslight and Coke, and South Metropolitan Companies—was agreed to.

Gas-Works in Illinois.—According to the Tenth Biennial Report of the Bureau of Labour Statistics of the State of Illinois, dealing with the year 1898, there are in that State 57 gas-works, all under private ownership. From 25 of these statistics were procured and tabulated. The oldest plant was put up in 1853, and the most recent in 1895. Of these establishments, 13 manufacture gas from coal alone, 7 from water only, and 5 use both. The cost of the coal ranged from 18¾c. to $3·10 per ton. The average investment represented by the 25 plants was $2,328,851; and of the gross income of all the plants, 86·39 per cent. was derived from the sale of gas. Of the income from this source, 72·43 per cent. was the revenue from lighting. General expenses constituted 12·75 per cent. of the whole cost; wages, 16·32 per cent.; materials and supplies, 28·34 per cent,; general distribution expenses, 9·35 per cent.; and taxes, 2·82 per cent. The aggregate quantity of gas accounted for by the 25 works was 402,434,374 cubic feet, and of this 12·16 per cent. was lost by leakage, 1·42 per cent. was used in the works and offices of the Companies, 86·17 per cent. was sold, and 0·25 per cent. was on hand and carried forward at the end of the year. Of the 25 plants, 11 showed more or less loss, varying from $89 to $3416 on the year's business, and 14 made a net profit on the total investment, varying from 0·79 to 15·9 per cent. The selling price per 1000 cubic feet to meter users varied from $1·35 to $8, at both of which prices in these two particular instances the result of the operation was a profit.

Increase in Price.—The Brixham Gas Company have advanced the price of gas for public lighting from 4s. to 4s. 3d. per 1000 cubic feet.

Opposition to the British Gaslight Company's Bill.—At a recent special meeting of the Hanley Town Council, it was decided to oppose the Bill of the British Gaslight Company, in order to obtain, if possible, the insertion of a clause to enable the town to become the purchasers of the gas-works whenever such a step might be thought advisable.

Advance of Halifax Gas Workers' Wages.—Last Wednesday, the Halifax Town Council confirmed, without discussion, the following advances of wages to the men employed at the gas-works: Stokers and firemen, from 5s. to 5s. 2d. per shift; coal wheelers, from 4s. to 4s. 4d. per shift; labourers when engaged at the purifying-boxes, from 5½d. to 6d. per hour; and foremen stokers to 44s. per week of seven shifts.

Acetylene an Explosive.—The "London Gazette" last Tuesday contained a notice that, after the expiration of 40 days from that date, it is proposed to submit to Her Majesty in Council the draft of an Order providing that acetylene, when in admixture with atmospheric air or with oxygen, shall be deemed to be an explosive within the meaning of the Explosives Act, 1875; and that it shall not be "manufactured, imported, kept, conveyed, or sold."

Bordeaux Gas Company.—In the year ending June 30, 1899, the Bordeaux Gas Company sent out about 885⅓ million cubic feet of gas, which brought in a revenue of £146,349. Compared with the preceding year, these figures show a decrease of 23¾ million cubic feet in sales, and £6736 in revenue. The Directors therefore recommended a dividend less by 10 frs. per share than that previously declared, especially in view of the almost certain increase in the cost of production consequent upon the advance in the price of coal. It was, however, at the rate of 80 frs. per share of 500 frs., or 16 per cent.

Bristol Water Company's Bill.—An extraordinary meeting of the shareholders of the Bristol Water Company has been held, to formally approve of the promotion of a Bill for extended powers. In the absence of Mr. E. Bush, the chair was taken by Mr. H. N. Abbot, who explained that the Bill was a small supplementary measure to put the finishing touches on the Act of 1889, and to keep the Yeo water in the best possible state of purity. In the exercise of the Company's powers, the Directors had already begun considerable works, and had, with the assistance and countenance of the District Councils of Clutton and Axbridge, entered into agreements to carry out a large system of sanitation which would be for the benefit of the whole neighbourhood. They had to go to Parliament for confirmation of the steps taken; and they embraced the opportunity to bring their sanitary powers up to date for the good of the city, the country districts, and the shareholders. He also mentioned that the dam of the new reservoir was now in operation, and that there were already 500 million gallons of water stored. Replying to some observations, he added that the question of the purchase of the waterworks by the city did not concern them that day. Things were really in exactly the same position as at the last annual meeting. A motion that the Bill be approved was unanimously carried.

The "CZARINA."

Season 1899-1900.

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New works for the treatment of tar and ammoniacal liquor are to be erected at Dawsholm, Glasgow.

The Registered Offices of the Voelker Incandescent Mantle, Limited, have been removed to No. 33, Old Broad Street, E.C.

The Malvern Link District Council last Tuesday accepted tenders to the amount of £15,263 for extensions at the gas-works.

At the last meeting of the Ilkeston Town Council, the salary of the Gas Engineer (Mr. F. C. Humphreys) was raised by £50 per annum.

The salary of Mr. Arthur Andrew, the Superintendent of the Gas and Water Department of the Oldham Corporation, has been increased by £70 per annum.

Owing to the cost of the acetylene lighting at Burnham (Essex) last year being much greater than the District Council were led to expect, it has been decided to discontinue the system, and use ordinary gas.

Messrs. John Wright and Co., Limited, of Birmingham, held an exhibition of their gas stoves and appliances in the David Thomas Memorial Hall, Bristol, last week. An attraction were the cookery demonstrations of Miss Mary Weston.

The Otley Gas Company have placed an order with Messrs. R. Dempster and Sons, Limited, of Elland, for the construction of a 96-feet three-lift gasholder, with steel tank, foundations, &c. The work will be carried out under the supervision of Mr. G. W. Lupton, the Company's Engineer and Manager.

A meeting of the Board of Conciliation for the Durham Coal Trade was held at Newcastle last Tuesday—Sir David Dale, Chairman of the Board, presiding. After considerable discussion, it was resolved that after "pays" commencing on the 12th and 19th inst., wages be advanced by 5 per cent., not to be reduced until the August meeting under any circumstances, and not to be increased until the ascertained price reaches 8s. per ton.

The Middlesbrough Corporation have recently placed a contract with West's Gas Improvement Company, Limited, for coal-handling machinery, &c., in connection with their inclined retort installation, the order for which has been entrusted to Messrs. Jonas Drake and Son, of Halifax. West's Gas Improvement Company have also in hand elevating and conveying machinery for dealing with ore for the Smelting Corporation, Limited, of Ellesmere Port.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

Foolscap 4to, pp. 535, with 239 Illustrations and Steel-Plate Engraving (as Frontispiece) of WILLIAM MURDOCH, *Inventor of Gas Lighting. Morocco Gilt, 21s.; Roan Gilt, 18s.*

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[For Illustrated Advertisement, See Feb. 6, p. 366.]

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GAS CARBON Wanted, not less than 4-Ton Loads.

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Apply, stating Age and References, to B. GIBSON, Engineer and Manager, Gas-Works, SITTINGBOURNE.

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THE DERWENT VALLEY WATER BOARD.

APPOINTMENT OF ENGINEER.

BY the Derwent Valley Water Act, 1899, the Derwent Valley Water Board are authorized to construct six large Reservoirs in the Valleys of the Derwent and the Ashop in Derbyshire, together with important subsidiary Works in connection therewith to deal with an estimated flow of Fifty Million Gallons of Water per day. The Reservoirs will be constructed successively; and the execution of these and the other authorized Works is expected to occupy many Years.

Applications are now desired for the position of ENGINEER to the Board. The Engineer will be responsible for the Designing and Construction of the Works. He will be required to reside in the neighbourhood of the Works, and to devote the whole of his time to his duties under the Board, and to have daily personal charge of the work in hand. The staff of Assistants, Inspectors, Draughtsmen, Clerks, and others necessary in the carrying out of the work will be provided by the Board, and be under the direction of the Engineer.

The engagement will (subject to the services rendered being satisfactory) be certainly until the first two Reservoirs are completed (this work it is estimated will take some Ten Years to carry out), and may be a permanent one. The Engineer on his part will be required to enter into an agreement to remain in the exclusive service of the Board until the first two Reservoirs are completed. The Board reserve the power of determining the engagement with the Engineer on giving him Six Months' Notice, in case his services are not considered satisfactory.

It is indispensable that Candidates for the appointment should have had considerable experience in designing and constructing Reservoirs and Gravitation Water-Works.

The Board reserve the right (which they will probably exercise) to appoint, or take the opinion of, a Consulting Engineer or Consulting Engineers on the Works, when and as desired.

Each Applicant must furnish at least two References and *copies* of Testimonials (which cannot be returned, and which preferably should be printed); the Board having the right to call for the production of the originals.

Applicants must state Age, Experience, Present Position, Salary required, when at Liberty, and general state of Health. Personal Canvassing will be a disqualification.

Communications to be sent to me not later than the 10th day of March, 1900, marked on the outside "Derwent Valley Engineer."

JAMES BELL,
Clerk to the Board.

Bowton Buildings, Bowling Green Street,
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CHIEF Draughtsman wanted by a Firm of Contracting Gas Engineers. Must be well up in Constructional Ironwork. One accustomed to Gas Plant and Conveying and Elevating Plant preferred.
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State Age, Experience, and Salary expected, to No. 3425, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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WANTED, a Manager for a 25 Million Cubic Feet Gas-Works. Good Carbonizer, able to control Workmen, Superintend Sulphate Manufacture and Gas-Fitting Department, attend Consumers and keep Books by Double Entry. Salary £175-£200. Excellent opportunity for capable Man.
Apply, by letter, before the 24th inst., giving full details as to present and past Engagements, *copies* of recent Testimonials, when disengaged, &c., to No. 3430, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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THE Gas Department of the Cowes Urban District Council are willing to purchase two Second-Hand PURIFIERS. They should be about 20 feet square, and equipped with Four-Way Centre-Valve and Connections, Travelling Goliath, and Rails.
Full Particulars and Price to the Secretary of the Gas Department,

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FOR SALE—A 60-inch Letheby-Bunsen PHOTOMETER, and complete TESTING APPARATUS for Sulphur and Ammonia. All new in 1895.
Apply to H. MATTHEWS, Gas Examiner, CHELTENHAM.

FOR SALE—Two good Exhausters, to pass 5000 cubic feet per hour (Waller's), with Engines and Boiler complete. No reasonable offer will be refused.
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ENGINES and Exhausters, from 1500 to 30,000 cubic feet per hour, in Stock, ready for delivery. No reasonable offer refused.
J. F. BLAKELEY, Thornhill, DEWSBURY.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

BOROUGH OF BLACKPOOL.

THE Gas Committee are prepared to receive TENDERS for the making and erection of a STEEL RETORT-HOUSE ROOF, 260 ft. by 65 ft. span, at their new Gas-Works.
Plan, Specification, and Particulars for inspection at the Offices of the Gas Engineer.
Endorsed Tenders to be sent to the Chairman of the Gas Committee, not later than Saturday, Feb. 24.

By order,
JOHN CHEW,
Gas Engineer.

Gas Offices, Princess Street,
Blackpool, Feb. 9, 1900.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply of about
900 yards of 36-inch CAST-IRON PIPES, SPECIALS.
20 yards of 30-inch CAST-IRON SPECIALS.
Full Particulars may be obtained from the Gas Engineer, Gas Offices, Bloom Street, Salford.
Sealed Tenders, endorsed "Tender for Pipes," addressed to the Chairman of the Gas Committee, Town Hall, Salford, must be delivered to me not later than Three p.m., on Thursday, the 22nd of February, 1900.

L. C. EVANS,
Town Clerk.

Town Hall, Salford,
Feb. 10, 1900.

CARBURETTED WATER-GAS PLANT.

THE Gas Committee of the Todmorden Corporation are prepared to receive TENDERS for the supply, and fixing complete, including Oil-Tanks, Steam-Boilers, &c., required for a PLANT in duplicate, capable of producing 500,000 cubic feet of CARBURETTED WATER GAS per day.
Full Particulars can be obtained from the Engineer and Manager, Mr. H. Hawkins.
Tenders, endorsed "Carburetted Water-Gas Plant," to be delivered at the Town Clerk's Office, addressed to the Chairman of the Gas Committee, not later than Five p.m. on the 20th inst.
The Committee do not bind themselves to accept the lowest or any Tender.

By order,
H. HAWKINS,
Engineer.

RETORTS AND FIRE-CLAY GOODS.

THE Gas Committee of the Todmorden Corporation are prepared to receive TENDERS for the supply and fixing complete of the necessary INCLINED and HORIZONTAL RETORTS required by them for the present season.
Full Particulars can be obtained from the Engineer and Manager, Mr. H. Hawkins.
The Committee do not bind themselves to accept the lowest or any Tender.
Tenders to be delivered at the Town Clerk's Office, Town Hall, Todmorden, not later than Five p.m. on the 20th inst., addressed to the Chairman of the Gas Committee, and endorsed "Retorts, &c."

By order,
H. HAWKINS,
Engineer.

BOROUGH OF BARROW-IN-FURNESS.

THE Corporation are prepared to receive TENDERS for the supply of machine-moulded FIRE-CLAY RETORTS, FIRE-BRICKS, CAST-IRON PIPES, WROUGHT-IRON TUBES and FITTINGS, BRASS COCKS, GAS-METERS, and SULPHURIC ACID as may be required from the 1st day of April next to the 31st day of March, 1901.
Sealed Tenders, on Forms to be obtained at the Office of the Manager of the Gas and Water Works, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Stores," to be delivered at the Town Clerk's Office on or before Tuesday, the 27th inst.
The lowest or any Tender not necessarily accepted.

By order,
C. F. PRESTON,
Town Clerk.

Town Hall, Barrow-in-Furness,
Feb. 9, 1900.

ABERDARE AND ABERAMAN CONSUMERS' GAS COMPANY.

THE Directors are prepared to receive TENDERS for alteration to, and partial reconstruction of, their RETORT-HOUSE and OTHER WORKS.
Copies of the Specification and Form of Tender, and copy of the Drawing, can be obtained from the Engineers, Messrs. Stevenson and Burstal, 38, Parliament Street, Westminster, on and after Thursday, the 15th of February, on payment of Two Guineas, which will be returned upon the documents being returned, together with a *bonâ-fide* Tender.
Tenders, endorsed "Contract No. 1," to be sent (by post) to Evan Jones, Esq., Manager and Secretary of the Gas Company, Aberdare, on or before Thursday, the 1st of March next.
The Directors do not bind themselves to accept the lowest or any Tender.

EVAN JONES,
Secretary.

BOROUGH OF SMETHWICK GAS-WORKS.

BRIDGE AND RAILWAY SIDING.

THE Gas Committee are prepared to receive TENDERS for the construction and erection of a BRIDGE and RAILWAY SIDING into their Gas-Works situated at Rabone Lane, Smethwick.
The Work will be divided into five Contracts, for which separate Tenders must be submitted.

CONTRACT No. 1.

For building FOUNDATIONS and BRICK PIERS to carry Bridge and Elevated Sidings, Retaining-Wall, and other Brickwork.

CONTRACT No. 2.

For supplying and erecting a STEEL SKEW BRIDGE, about 158 feet span, over the Canal.

CONTRACT No. 3.

For supplying and erecting an ELEVATED SIDING in Gas-Works, about 337 feet long, in connection with No. 2.

CONTRACT No. 4.

For supplying and LAYING RAILS and POINTS over Bridge and Elevated Siding in connection with Nos. 2 and 3.

CONTRACT No. 5.

For supplying and fixing SELF-CONTAINED RAILWAY WEIGHBRIDGE to weigh 20 tons.

Copies of the Specifications and Contract Drawings will be supplied on application to the Engineer, Mr. B. W. Smith, Gas-Works, at a charge of £1 1s., which will be returned upon receipt of a *bonâ-fide* Tender.
The Contractor or Contractors will be required to pay the Standard Rate of Wages recognized in the District.
Tenders, endorsed "Contract No. 1, 2, 3, 4, or 5," as the case may be, and addressed to the Chairman of the Gas Committee, to be delivered to the undersigned on or before the 5th of March next.
The Committee do not bind themselves to accept the lowest or any Tender.

By order,
W. J. STURGES,
Secretary.

Gas Offices, Town Hall, Smethwick.

ISLE OF THANET GASLIGHT AND COKE COMPANY.

THE Directors of the above Company are prepared to receive TENDERS for the supply of CAST-IRON SOCKET and SPIGOT PIPES, with SPECIALS.

Particulars and Form of Tender may be had on application to the Engineer, Mr. James Dougall.

By order,
THOS. C. FULLER,
Secretary.

Company's Offices: The Dane,
Margate, Feb. 10, 1900.

BROMLEY GAS CONSUMERS' COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held at the "Bell" Hotel, Bromley, Kent, on Thursday, the 22nd day of February inst., at Six o'clock p.m. precisely, to receive the Report of the Directors, the Balance-Sheet certified by the Auditors, to declare a Dividend, and for General Purposes.

The TRANSFER BOOKS WILL BE CLOSED from the 8th to the 22nd inst., both days inclusive.

By order of the Board,
HENRY W. AMOS,
Secretary.

Offices: At the Works,
Bromley, Kent, Feb 7, 1900.

HORNSEY GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Offices of the Company, No. 63, Chancery Lane, in the County of Middlesex, on Friday, the 2nd of March, 1900, at Three o'clock in the Afternoon precisely, to receive the Report of the Directors and the Accounts for the Half Year ended the 31st of December last, to declare Dividends, elect two Directors and an Auditor; also that a Motion will be make to the effect that "B," "C," and "D" Ordinary Additional Capital Stocks be consolidated for the purpose of obtaining quotation on the Stock Exchange, and to transact the Business of a General Meeting.

The TRANSFER BOOKS WILL BE CLOSED from the 16th of February to the 2nd of March, both inclusive.

By order of the Board,
S. J. WILLIAMS,
Secretary.

Offices: 63, Chancery Lane.
London, W.C., Feb. 10, 1900.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, Willoughby Lane, Tottenham, on Saturday, the 24th day of February inst., at half-past Three o'clock in the Afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 31st of December, 1899, to declare Dividends, and to transact such other Business as the Act of Parliament directs.

The TRANSFER BOOKS for CONSOLIDATED STOCKS WILL BE CLOSED from Friday, the 9th inst., to Monday, the 26th inst., both days inclusive.

And Notice is Hereby Further Given, that, immediately after the transaction of the business of the above Meeting, an EXTRAORDINARY GENERAL MEETING of the Proprietors of the Company will be held for the purpose of considering a proposal of the Board of Directors to authorize the Borrowing of a Sum of Money by issue of Debenture Stock and the creation and issue of a portion of the Additional "B" Consolidated Stock, in accordance with the provisions of the Tottenham and Edmonton Gas Act, 1898.

By order of the Board,
JAMES RANDALL,
Secretary.

Offices: Willoughby Lane,
Tottenham, Feb. 2, 1900.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
HORNSEY GAS COMPANY.

£9000 FIVE PER CENT. PREFERENCE STOCK.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Thursday, the 22nd of February, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

Estate of Wm. Boards, Esq., deceased, and Miss Rowley, deceased.

SHARES AND STOCK IN THE
WEST HAM GAS COMPANY,
BOURNEMOUTH GAS AND WATER COMPANY,
LEA BRIDGE DISTRICT GAS COMPANY.
TO BE SOLD BY AUCTION BY

MR. ALFRED RICHARDS, at the Mart, E.C., on Thursday, Feb. 22, 1900, at Two o'clock.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

MITCHAM AND WIMBLEDON DISTRICT GAS-LIGHT COMPANY.

(INCORPORATED BY ACT OF PARLIAMENT, 1867.)

NOTICE is Hereby Given, that the SIXTY-SIXTH ORDINARY HALF-YEARLY GENERAL MEETING of the Shareholders of this Company will be held in the Board-Room, at the Works, Mitcham, in the County of Surrey, on Tuesday, the 27th day of February, 1900, at Three o'clock in the Afternoon precisely, to receive the Report of the Directors and a Statement of the Accounts for the Half Year ended the 31st day of December last, to declare a Dividend, to elect Directors and an Auditor in place of those retiring by rotation, and for General Business.

The TRANSFER BOOKS WILL BE CLOSED from the 12th inst, until after the Meeting.

By order,
BENJAMIN GREEN,
Secretary and Manager.

Offices and Works:
Western Road, Mitcham,
February, 1900.

SUNDERLAND AND SOUTH SHIELDS WATER COMPANY.

IMPORTANT SALE OF WATER STOCK.

TO BE SOLD by Auction in the Long Room of the Queen's Hotel, Fawcett Street, Sunderland, on Thursday, Feb. 22, 1900, at Two o'clock in the Afternoon prompt.

MR. ATKINSON GIBSON, AUCTIONEER,

£25,000

Nominal) of the New Stock (Maximum Dividend 5 per cent.) authorized to be created and issued under the powers contained in the Sunderland and South Shields Water Act, 1891.

The above Stock will be entitled to Dividend from the 1st day of January, 1900, and be registered in the name of the Purchaser free of charge.

A deposit of 10 per cent. will be required at the time of Sale; the remainder to be paid on or before the 1st day of March, 1900.

BRENTFORD GAS COMPANY.

SALE BY TENDER OF £46,875 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

IN pursuance of the Brentford Gas Order, 1881, Notice is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER £46,875 FOUR PER CENT. PERPETUAL DEBENTURE STOCK of the Company, to be paid up in full on or before the 31st day of March; such Stock being a portion of Additional Capital authorized to be raised by Resolutions passed at an Ordinary Meeting of Proprietors held on the 11th day of February, 1898, under the powers of the above-mentioned Order.

Particulars and Conditions of Tender may be obtained on application at this Office, and sealed Tenders must be sent in not later than Twelve o'clock (noon) on Monday, the 12th day of March next.

By order,
WILLIAM MANN,
Secretary.

Office, Brentford Gas Company,
Brentford, Feb. 8, 1900.

PUBLICATIONS

ISSUED BY

WALTER KING,

11, BOLT COURT, FLEET STREET, E.C.

COMPLETE REPORTS OF PROCEEDINGS OF THE DISTRICT ASSOCIATIONS OF GAS ENGINEERS AND MANAGERS FOR 1899. *Price 5s. 6d., post free.* The Volumes issued since the series commenced in 1883 are still on sale.

THE POWERS OF CHARGE OF THE METROPOLITAN GAS COMPANIES: A History of the Question of Price in London from the Introduction of Gas Lighting to the Present Time. By LAURENCE W. S. ROSTRON, M.A., B.C.L., of New College, Oxford, and Lincoln's Inn, Barrister-at-Law. With a Preface by GEORGE LIVESEY, M.Inst.C.E. *Price 6s., post free.*

THE FLOW OF GASES AND PROPORTIONING GAS MAINS—FOUR DIAGRAMS (with explanatory pamphlet) for determining at a Glance the various Problems involved in Proportioning Gas Mains and Services to suit the varying conditions of Diameter, Length, Pressure, Specific Gravity, and Discharge, with Notes as to the Allowances to be made for Bends, Branch Mains, and other Disturbing Influences. By F. SOUTHWELL CRIPPS, Assoc.M.Inst.C.E. *Price 7s. 6d.*

AUTOMATIC METER REGISTER. — The Meter Life Book specially adapted and revised for "Slot" Meter Registration by ROBERT P. KEYS. *In sizes to record* 1000 *Meters, with Index, half bound,* 42*s.*; *to record* 500 *Meters,* 35*s.*; *to record* 250 *Meters,* 31*s.* 6*d.*

DEVONPORT WATER COMPANY.

FIFTH ISSUE OF £4 PER CENT. PREFERENCE STOCK TO RAISE £10,000.

FIRST PAYMENT OF INTEREST WILL BE MADE ON THE 29TH OF SEPTEMBER NEXT.

The Company having for more than Ten Years past paid a Dividend of £5 per cent. on its Ordinary Stock, the Preference Stock now offered is, under the Trustees Investment Acts, an available Investment for Trustees who are not expressly forbidden from investing therein by the Instrument (if any) creating the Trust.

THE Directors of the Devonport Water Company are prepared to receive TENDERS for the sum of £10,000, or any part thereof, in sums of £50 and upwards (being multiples of £10), free from all Charges and Expenses.

Tenders, stating the Price per Cent., which must not be below £125 per Cent., should be sent to the Secretary, on or before the 28th of February next.

The Security comprises the Income from Water-Rates and other Sources, which for the past Eight Years have annually exceeded £12,000, and which for the past Year exceeded £15,000.

The Stock to be issued will be entitled to a Preferential Dividend in Perpetuity over the Ordinary Stock.

For a Prospectus giving further Particulars and Form of Tender, apply to the Naval Bank, Plymouth; or to

FOSTER J. BONE,
Secretary.

23, Ker Street, Devonport,
Jan. 29, 1900.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.
GAS ENGINEERS' AGENTS AND CONTRACTORS FOR
Meters, Fire-Clay Goods, Oxide of Iron, and all other Gas Apparatus. Retort Carbon purchased.
Inquiries Solicited.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

HARDMAN & HOLDEN, LD.

ESTABLISHED 1820.

SULPHURIC ACID.

GUARANTEED absolutely free from Arsenic, and of excellent Purity. Specially prepared for Sulphate of Ammonia Manufacturers.

Works: BLACKBURN; Miles Platting and Clayton, MANCHESTER.

Head Office: Miles Platting, MANCHESTER.

Inquiries Solicited.

LONDONDERRY GAS COALS

FROM THE

LONDONDERRY COLLIERIES,

COUNTY OF DURHAM.

Available Output up to 5000 Tons per day.
Yield of Gas 11,000 cubic feet per Ton of Coal as per Analysis by
Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,
SEAHAM HARBOUR,
COUNTY OF DURHAM.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF

FILES OF BEST QUALITY
FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

LONDON OFFICE:
90, CANNON STREET, E.C.

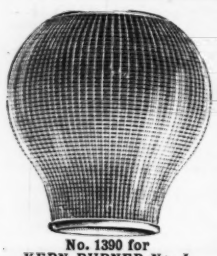
OSLER,
BIRMINGHAM.

MANUFACTURERS
OF GASELIERS
IN GLASS AND METAL.

WILSON CARTER & PEARSON,
GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.

ADDRESS CHIEF OFFICES:
Temple Buildings, 50, New Street, Birmingham.



No. 1390 for
KERN BURNER No. 4.

AN IMMENSE IMPROVEMENT
Has been made in the method of Manufacturing the
"HOLOPHANE" PATENT LIGHT DIFFUSING GLOBES.

The Globes are now MUCH LIGHTER in weight, MORE ARTISTIC in design, and MORE EFFICIENT in light control. An entirely new Series of Patterns. Send post-card for new Catalogue to

"HOLOPHANE" Ltd., 146A, Queen Victoria St., London, E.C.

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 34, OLD BROAD STREET, E.C.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY
RAVENSTHORPE, NEAR DEWSBURY.

HOLMSIDE
GAS COALS.
Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton	11,205 Cubic Feet.
Illuminating Power	16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality)	13¾ Cwt. per Ton.
Sulphur	A little over 1 per Cent.
Ash	Under 1 per Cent.
Tar	163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor	103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR
PELTON GAS COALS.
Present Daily Produce available 3000 Tons.

Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.

Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,
HOLMSIDE & SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.

For Particulars Price, &c., apply to Mr. EDWARD PRICE, 119, Queen's Road, FINSBURY PARK, N.

Prices are Reduced.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH N.B.

BOLDON GAS COALS.

ANALYSIS.

Yield of Gas per Ton	10,500 Cubic Feet.
Illuminating Power	16·9 Candles.
Coke	66·7 Coke.
Sulphur	0·86 Sulphur.
Ash	2·04 Ash.

For Prices, &c., apply to
W. H. PARKINSON,
THE HARTON COAL CO., LTD.,
NEWCASTLE-ON-TYNE.

Telegraphic Address: "PARKINSON, NEWCASTLE."

THORNLEY GAS COALS
WORKED BY THE
WEARDALE IRON & COAL Co., Ld.
OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by
Messrs. J. & H. S. PATTINSON.

Yield of Gas per Ton	10,500 Cub. Ft.
Illuminating Power	16·9 Candles.
Coke (of good quality)	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c., apply to the
WEARDALE IRON & COAL Co., Ld.
QUAYSIDE, NEWCASTLE-ON-TYNE.

JAMES OAKES & CO.
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887,
for
CANNEL & COAL.

TYNE
BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft
Illuminating Power	38·22 candles
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to
THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
E. FOSTER & CO.,
21, JOHN STREET, ADELPHI, LONDON W.C.

NEW SUNLIGHT INCANDESCENT CO., LTD.

33-34, SHOE LANE, LONDON, E.C.

THE

"SIMPLEX" CHIMNEYLESS BURNER

Manufactured under the De Mare MASTER Patent and subsequent Minor Patents.

SEE CAUTION BELOW.

IN THREE SIZES, as follows—

No. 2.
COTTAGE SIZE.

No. 3.
FOR SHOP AND INTERIOR LIGHTING.

No. 4.
STREET LIGHTING.

With SUNLIGHT WHITE MANTLE.

The "Simplex" is fitted with a Removable Cap and an Air-Adjusting Ring, making it quite easy for anyone to adapt the Burner to the very varying Pressures and Qualities of Gas in different parts of the country.

The "Simplex" Burner is so constructed as to make the light practically shadowless; and this, coupled with the fact that it is of a much more artistic shape, gives it an enormous advantage over the very unsightly competing infringement for the moment on the market.

Maximum Light (without artificial pressure) 125 Candle Power.

CAUTION! CAUTION!! CAUTION!!!

INCANDESCENT GAS LIGHTING.

All Dealers and the Public are **CAUTIONED** against Buying, Selling, or Using "**NEW WELSBACH**" (commonly known as the "**KERN**") **BURNERS.**

ACTIONS FOR INFRINGEMENT OF PATENT HAVE BEEN COMMENCED by the **NEW SUNLIGHT INCANDESCENT COMPANY, LIMITED**, against the **WELSBACH COMPANY** for Infringement of the **DE MARE PATENT** by the **MANUFACTURE AND SALE** of such Burners, and are about to be commenced against Dealers and Users for Infringement of our Patent in respect of their Sale or Use. **USERS** are equally liable with **DEALERS.**

NEW SUNLIGHT INCANDESCENT CO., LTD.

33-34, SHOE LANE, LONDON, E.C.

...packing pr...
...time was held exclusively by Great
...merica.
...but at present a great deal is imported from
The Eveson Coal & Coke Company, Ltd., of
184, Edmund Street, Birmingham, claim to have
promptly fulfilled all their Contracts during this
trying winter, and they have still "Spot" lots of
Gas-Coal and Cannel for quick delivery.
Wire Netting and Rope.—These goods are ex-
...tensively used in the mining districts, especially brass
...g, which is all imported from the ...
...are extensively used ...

THE THAMES BANK IRON CO.

UPPER GROUND STREET, LONDON, S.E.,

SUPPLY FROM STOCK

CAST-IRON RETORTS

AND ALL KINDS OF GAS-WORKS APPARATUS.

SOCKET-PIPES FOR GAS OR WATER PURPOSES.

FLANGE PIPES FOR STEAM.

Sole Manufacturers of LYON'S "PATENT" GAS-MAIN SYPHONS.

AGENTS FOR

ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

ARROL-FOULIS

Patent Automatic Machinery

FOR

DRAWING AND CHARGING GAS-RETORTS.

Full Particulars may be obtained from the Sole Makers,

SIR WILLIAM ARROL & CO., Limited,

GLASGOW.

[See Illustrated Advertisement, Feb. 6, p. 370.]

BEST & LLOYD

Limited,

MAKERS OF THE **BIRMINGHAM.**

PATENT "SURPRISE" PENDANT,

WITH PATENT SHADE.

The ONLY GAS-PENDANT suitable for Domestic Lighting; a room 18 ft. by 14 ft. being beautifully illuminated with one Incandescent Burner.

Extract from the JOURNAL OF GAS LIGHTING, Jan. 8, 1895.

"IN CONJUNCTION WITH

THE INCANDESCENT GAS-LIGHT

it quite **supersedes** the familiar three-light pendent. We are able to bear witness to the **convenience** of the New Pendant."

JAMES MILNE & SON, LTD.,

GAS ENGINEERS

MILTON HOUSE WORKS EDINBURGH.

LONDON. —— LEEDS. —— GLASGOW.

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

Midland and West of England District Office: 6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.

Telegraphic Address: "WIGAN, BIRMINGHAM." Telephone No. 200.

London District Office: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.

Telegraphic Address: "PARKER, LONDON."

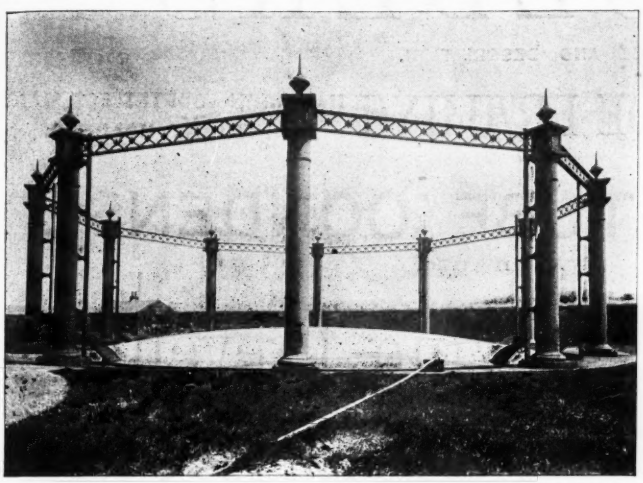
WORKMANSHIP and MATERIALS OF THE HIGHEST QUALITY.

PECKETT'S LOCOMOTIVES

Built to any Specification or Gauge.

PECKETT & SONS, Atlas Locomotive Works, **BRISTOL.**

GASHOLDERS



A GASHOLDER

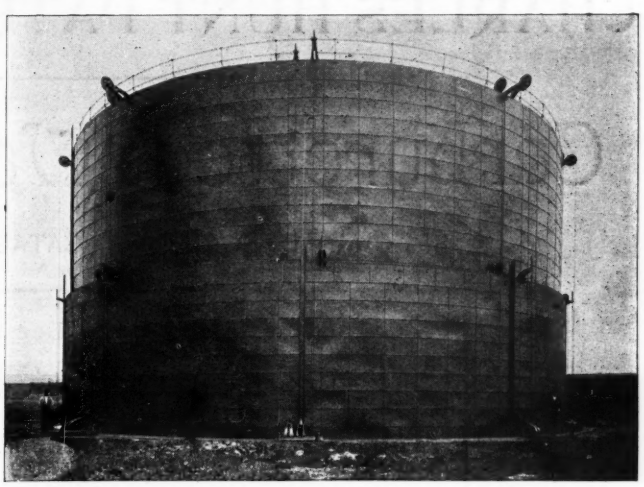
Guided by Ten massive Cast-Iron Columns and Girders is shown in the accompanying Photo.

AS IT WAS

originally erected by us

IN 1883.

We last year took down the Guide-Framing, converted the Holder into a Two-Lift; and this Photo. ☛ shows it



AS IT IS NOW

entirely guided by our Patent Steel Cable System.

In many other instances, Columns have been sold and replaced by our Cables.

We are prepared to alter any Holders in a similar manner to the above. Engineers who have trouble with the irregular working of Column-Guided Holders will find the Cable System vastly superior and quite reliable.

PATENTEES AND SOLE MANUFACTURERS:

ASHMORE, BENSON, PEASE, & CO., LTD.

GAS AND ELECTRICAL ENGINEERS,

MANUFACTURERS OF

Accumulators, Complete Installations for Light and Power, Gasholders (with and without Columns), Purifiers, Scrubbers, Condensers, Washers, Roofs, Girders, Sulphate Plants, Valves, &c., &c.

London Office: 181, QUEEN VICTORIA STREET, E.C.

Telegrams: "Gasholder, Stockton-on-Tees." "Apparatus London."

Paris Office: 3, SQ. DES BATIGNOLLES.

S. CUTLER AND SONS, MILLWALL, LONDON.

GASHOLDERS

OF EVERY SIZE AND DESCRIPTION.

CUTLER'S PATENT GUIDE-FRAMING HAS BEEN ADOPTED FOR MANY IMPORTANT HOLDERS.

PATENT WATER-TUBE CONDENSER

Over 120 now in use.

Cutler's Patent Freezing Preventer

For keeping Cups of Gasholders free from Ice.

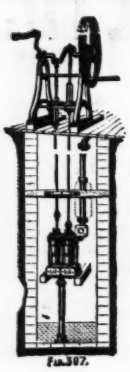
CHARLES HUNT PATENT GAS-WASHER.

Carburetted Water-Gas Plant.

SPECIAL DESCRIPTIVE CATALOGUE ON APPLICATION.

Instructions have been received from the
BRENTFORD GAS COMPANY to put in hand
a FOURTH SET of our CARBURETTED WATER-GAS PLANT;
this being the Second Time
the Original Plant has
been extended.

JOSEPH EVANS & SONS, CULWELL WORKS, WOLVERHAMPTON.

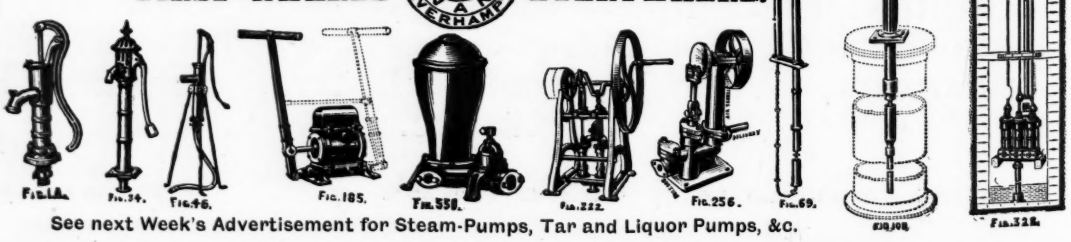


PLEASE APPLY FOR CATALOGUE No. 8.

TRADE MARK.

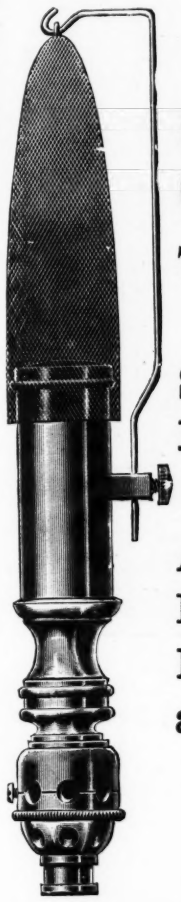
Telegrams: "EVANS, WOLVERHAMPTON." National Telephone No. 7039.

FIRST AWARDS EVERYWHERE.



See next Week's Advertisement for Steam-Pumps, Tar and Liquor Pumps, &c.

THE
INTENSIFIED GAS LIGHT COMPANY, LTD.



HIGH-PRESSURE PATENTS.

300 CANDLES PER BURNER

Three Burners consuming 30 cubic feet per hour give a Light of 1000-Candle Power at half the cost of Electric Light.

Specially adapted for Lighting Railway Stations, Docks, Sheds, Workshops, Streets and Squares, Shop Windows, &c., &c.

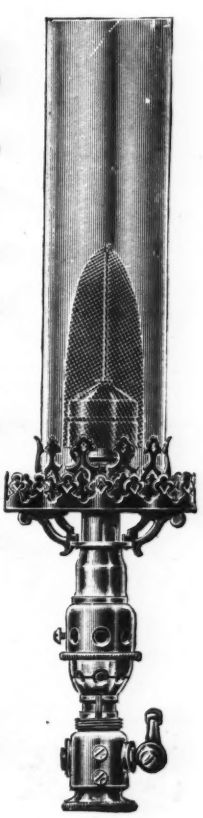
Adopted by the L. & N.W. and Great Central Railways at their Euston and Marylebone Termini, the Crystal Palace, London Pavilion, Mersey and Leith Dock and Harbour Boards, Edinburgh and Leeds Gas Committees, &c., &c., &c.

Specially Low Terms to Gas Companies for Trial Installations.

"The perfection of artificial lighting on the large scale."—"*Journal of Gas Lighting*," April 18, 1899.

ORDINARY GAS PRESSURE PATENTS

The Intensified Company's Improved Incandescent Burner gives **25 CANDLES PER FOOT**, or 60 Candles for $2\frac{1}{2}$ feet. No other Burner on the Market can compare with this. Price, with Mantle and Chimney, from 6s. 6d. Send for Complete Lists.



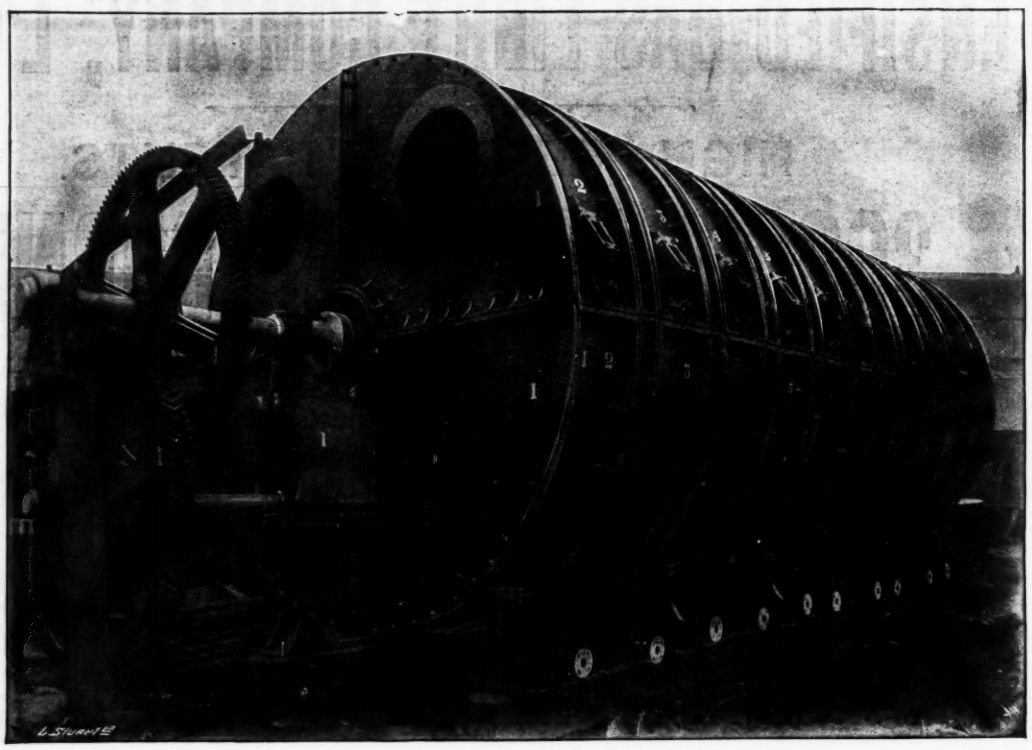
The most Effective and Economical Burner on the Market for both Indoor and Outdoor Lighting. Mantles specially manufactured for the Company, for both Systems, by the Welsbach Incandescent Gas-Light Company.

For full Particulars apply to the Company's Works—

3, WILSON ST., DRURY LANE,
LONDON, W.C.

PATENT "NEW" SCRUBBER-WASHER

RESULTS GUARANTEED.



RESULTS GUARANTEED.

Photo. of Machine recently erected at Gaythorn Gas-Works, Manchester.

NOTE: Orders already received in

1900

For **MACHINES** to deal with

21,000,000

CUBIC FEET OF GAS PER DIEM.

[*Extract from Paper by* Mr. T. N. RITSON, Assoc.M.Inst.C.E., of Kendal, *read before the* MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS, *June* 3, 1899.]

"A HOLMES' PATENT ROTARY 'NEW' WASHER-SCRUBBER was erected in the autumn of 1895, and is capable of dealing with half-a-million cubic feet of gas per day. This washer completely purifies the gas from ammonia, with from 10 to 12 gallons of water per ton of coal carbonized, leaving only 0·3 to 0·5 grain of ammonia in the gas at the outlet. Since this machine was erected, THE YIELD OF SULPHATE OF AMMONIA HAS BEEN MORE THAN DOUBLED."—"Journal of Gas Lighting," *June* 6, 1899.

Patentees and Sole Makers:

W. C. HOLMES & CO., WORKS: **HUDDERSFIELD.**

TELEGRAMS: "IGNITOR, LONDON." "HOLMES, HUDDERSFIELD."

INCLINED RETORTS

UP-TO-DATE FURNACES AND SETTINGS.

J. & H. ROBUS, 20, Bucklersbury, London, E.C.

HARPER & MOORES,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS, GAS-RETORTS,
LUMPS, TILES, AND ALL ARTICLES IN FIRE-CLAY.
Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.

Manufacturers of Glasshouse Pots and Crucibles of every kind.
Established 1836.

BOWENS' Ltd. Successors,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
Established 1860.

JOSEPH CLIFF & SONS,
INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.
WORTLEY, LEEDS.

LONDON OFFICES & DEPÔTS:
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WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.
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16, Lightbody Street.
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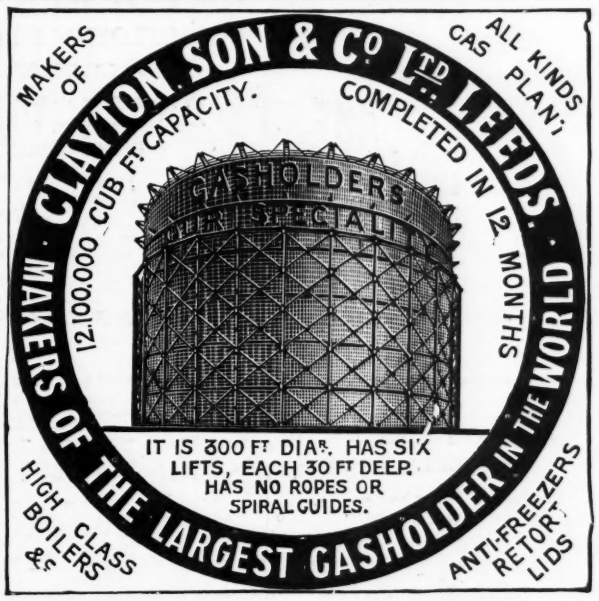
MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.
Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.


MAKERS OF
CLAYTON, SON & Co LTD LEEDS.
ALL KINDS GAS PLANT
12,100,000 CUB FT CAPACITY.
COMPLETED IN 12 MONTHS
GASHOLDERS
SPECIALITY
IT IS 300 FT DIAM. HAS SIX LIFTS, EACH 30 FT DEEP. HAS NO ROPES OR SPIRAL GUIDES.
MAKERS OF THE LARGEST GASHOLDER IN THE WORLD
HIGH CLASS BOILERS &c
ANTI-FREEZERS RETORT LIDS

GIRDERS, ROOFS, & ALL KINDS OF STRUCTURAL IRONWORK.

London Office: 60, QUEEN VICTORIA STREET, E.C.
Telegraphic Addresses: "GAS, LEEDS." "ECLARAGE LONDON."

INTERESTING EXTRACT FROM AN ENGINEER'S LETTER.

RECEIVED JAN. 25, 1900.

"During the Summer this town was visited by a severe typhoon **LASTING THREE DAYS.** The peculiarity of our typhoon is the wind seems to come in **TREMENDOUS GUSTS** from varying directions. This, of course, tests the stability of any structure; and you will therefore be glad to hear that your **SPIRAL-GUIDED GASHOLDER** stood the trial admirably. Our Gasholders with Columns and Girders were oscillating over 4 inches; but although the spiral was inflated well up in the second lift, there was **NO VISIBLE MOVEMENT.** This is extremely gratifying to me after advising my Directors to adopt your type. Please let me know **IF YOU CAN INCREASE THE STORAGE OF MY OTHER GASHOLDERS ON THIS SYSTEM** by adding additional Lifts."

Any further Information required should be obtained from

R. & J. DEMPSTER, LTD.

(Who are Sole Proprietors of the Spiral Gasholder Patents),

GAS PLANT WORKS, OLDHAM ROAD,

MANCHESTER.

Telegraphic Address:
"Scrubber, Manchester."
Telephone Nos. 54 & 2296.

London Office:
165, Gresham House,
Old Broad Street, London, E.C.

HUTCHINSON BROS. & CO., LD.

GAS ENGINEERS, &c.,

MANUFACTURERS OF IMPROVED

WET AND DRY GAS-METERS.

STATION-METERS. LAMP-METERS.

TEST GASHOLDERS & GENERAL GAS APPARATUS.

BRASS MAIN AND LAMP TAPS.

UNIONS, FERRULES, ETC.

The "Falcon" Lamplighter's Torch. Service Cleaners

SYPHON AND OTHER PUMPS.

Wood and Wrought-Iron Purifier-Grids. Scrubber Boards

WET AND DRY METERS REPAIRED.

FALCON WORKS, BARNSLEY.

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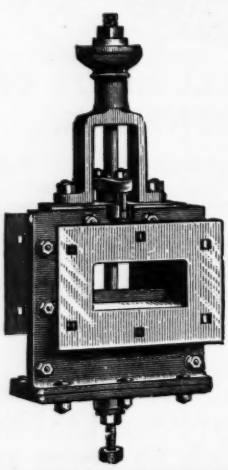
SERVICE CLEANER.

LAMP SERVICE CLEANER.

Telegraphic Address: "CLAPHAM BROS., KEIGHLEY."

National Telephone No: "KEIGHLEY 35."



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KEIGHLEY, YORKS. ESTABLISHED 1857

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PATENT REGENERATIVE FURNACES

— FOR —

ENGLAND, WALES & ABROAD.

RETORT BENCHES ERECTED COMPLETE WITH OR WITHOUT SPECIAL FURNACES.

RESULTS GUARANTEED.

OVENDEN HALIFAX

RETORT SETTERS. FURNACE BUILDERS. ETC. ETC.

Designs and Estimates on Application.

GASEOUS FIRING A SPECIALTY.

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